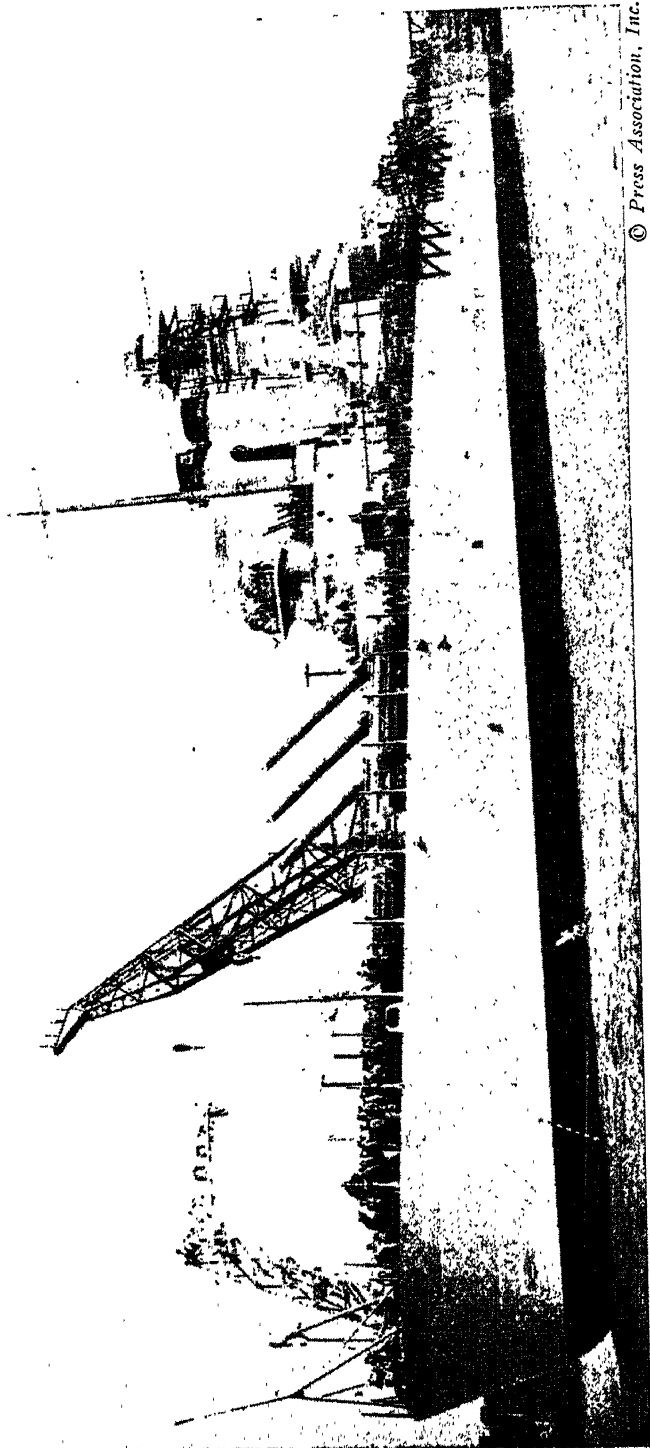


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A view of the U. S. S. North Carolina.

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—An Illustrated Treasury of Knowledge—

Prepared under the Editorship of

C. RALPH TAYLOR

Advisory Editor

CARL VAN DOREN

WITH SPECIAL ARTICLES AND DEPART-
MENTAL SUPERVISION BY 462 LEADING EDITORS,
EDUCATORS AND SPECIALISTS IN THE
UNITED STATES AND EUROPE

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VOLUME V

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VOLUME V

Electric Traction

Electric Traction. Since the first practical application of electric power for the movement of vehicles about 60 years ago, a number of widely different ways of utilizing this method of propulsion have been developed. Although each has its own distinctive characteristics, the more important applications all employ the general principle of obtaining electrical energy from a remote generating station and feeding it as desired to electric motors which actuate the wheels of the vehicles. The vehicles operated in this way divide themselves into four main classifications: (1) the individual electric rail car; (2) the multiple-unit electric train; (3) the electric locomotive; (4) the trolley bus.

Early History of Electric Traction.—A number of electric railways were installed in the United States and other countries in the decade beginning in 1880. Prior to that time experiments had been in progress for many years leading up to the practical adaptation of electricity to propulsion. Beyond showing that vehicles could be propelled by electric power, these early experiments had little value. It was the invention of the electromagnetic dynamo in 1861 that made possible the real development of electric traction.

During this period experiments were being made in United States by Thomas A. Edison, Stephen D. Field and others. About this time Frank J. Sprague was endeavoring to convince the management of the elevated railways in New York City that electricity would be superior to steam as a motive power. Not being successful in this, he transferred his activities to surface street cars, soon going to Richmond where he built the line which began operation in February, 1888. The essential principles of the Richmond installation were the same as those followed by the street railways of the present day. Energy was obtained from an electric generating station through feeder wires connecting with a contact wire suspended above the center of the track. From the contact wire the current passed through an under-running trolley wheel and thence to the car. Motors were mounted directly on the axles of the car and geared to them by double-reduction gearing. The track was used as a return circuit connected electrically to the generating station.

Development of Electric Traction.—The

Electric Traction

success of the installation at Richmond gave great impetus to the electrification of street railways throughout the United States. By 1890 more than 1,300 miles, or about 15 per cent. of the total street railway trackage, was being operated electrically. Rapid expansion occurred during the following decade. In 1901 the electrified trackage had increased to about 22,000 miles, or 97 per cent. of the total of street car lines, practically all of the animal-drawn and cable lines having been superseded by electricity. Extension of electrified mileage continued steadily until about 1920. Since then a small decrease has been recorded in the street and inter-urban track mileage, the gasoline motor bus having been found more economical to serve some routes in sparsely settled territory and for other special purposes.

Electrification of steam railroads began in 1895. First to be electrified were the Nantasket Beach Branch of the New York, New Haven & Hartford Railroad and the Baltimore Tunnel of the Baltimore & Ohio Railroad.

The first real rapid transit railway in the United States commenced operation in New York City in 1871. At the beginning and for many years thereafter, it was operated by steam locomotives. Proposals were made at various times for its electrification, one of them being the project on which F. J. Sprague was engaged immediately prior to his building the first electric street railway in Richmond. It was not in New York, however, but in Chicago that electric rapid transit service was first inaugurated. This was in 1895, on the Metropolitan West Side Elevated Railway. Electric locomotives were used on this and other early elevated railroads. In 1898 the multiple-unit car system was devised and stimulated progress greatly. The first underground electric rapid transit line was the Tremont Street subway in Boston, opened in 1898. The first Interborough Subway in New York City commenced operation in 1904.

As a result of the increased cost of track construction in the years following the World War, a new type of rail-less electric vehicle was introduced in a number of cities in the United States. This was first called a 'track-less trolley,' but later the name 'trolley bus' was adopted. As its name implies this vehicle is an electric trolley car equipped with rubber

tired wheels to operate over ordinary pavement instead of operating with steel wheels on steel rails.

The Electric Rail Car and Its Equipment.—Certain basic elements are common to all form of electric traction. Adjacent to the track there is a conductor through which the current is obtained from the generating station. This conductor may be a wire suspended above the track as is used by the ordinary trolley car, or it may be a third rail close to the ground paralleling the two track rails as is used on rapid transit lines and some electrified steam railroads, or it may be a contact rail placed under-

From a technical standpoint the development of the electric rail car and its equipment can most conveniently be considered under five principal topics: (a) motors and trucks; (b) control equipment; (c) brakes and brake rigging; (d) current collection devices, and (e) car bodies.

Motors for Electric Cars.—Motors used for the propulsion of electric rail cars are the same in principle as those used for a wide variety of other purposes. The most difficult problem always has been to transmit the rotating motion of the armature to the wheels of the car. In some of the early electric cars the armatures

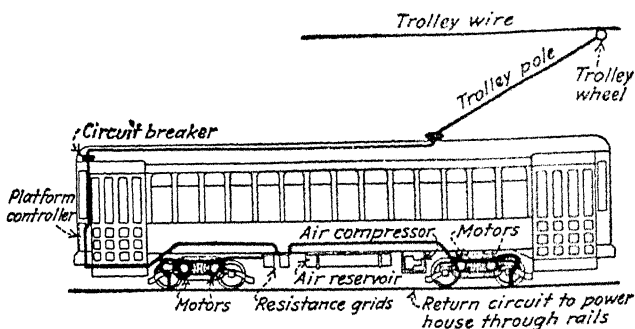


Diagram of Electric Rail Car Showing Path Followed by Current from Trolley Wire through Circuit Breaker, Controller, Resistance, and Motors to the Running Rail.

ground between the track rails as is used for street railway operation in parts of New York City and Washington, D. C. Second, there is a current collecting device of some sort, through which the electrical energy is obtained from the contact wire or contact rail. In the ordinary trolley car the current collecting device is a small revolving wheel at the end of a pole extending upward from the roof of the car. Where energy is obtained through a contact rail either above or below ground, the current collecting device is in the form of a sliding shoe. From the collector the current passes to the control equipment. Essentially this is simply an arrangement of electric switches whereby the motors are grouped in suitable combinations and variable resistance is introduced into the circuit to regulate the speed. The motors themselves are mechanically connected to the axles and wheels so that rotation of the motor armature produces movement of the car along the rails. After leaving the motors the current passes down through the wheels to the rail and thence back to the power generating station.

were built directly on the axles. This simplified the driving mechanism by avoiding the necessity for intermediate gearing, but was found impracticable in other ways.

The motors developed in the years following the initial success of the electric railway were of somewhat slower speed than those used by Sprague on his first cars. This permitted a change from double reduction to single reduction gearing. Subsequent developments until 1925 were generally in the nature of increasing the size and efficiency of the motors without any essential change in the general design. About that time, however, attention was being directed to means of reducing car weight and improving riding qualities. A small light-weight, high-speed motor having been developed for use on automotive vehicles, experiments were undertaken to adapt it to use on the electric rail car. The motors were mounted with the armature shaft at right angles to the axle and connected thereto by a flexible shaft and worm gear. Another method of accomplishing the same object is a design with light-weight, high-speed motors

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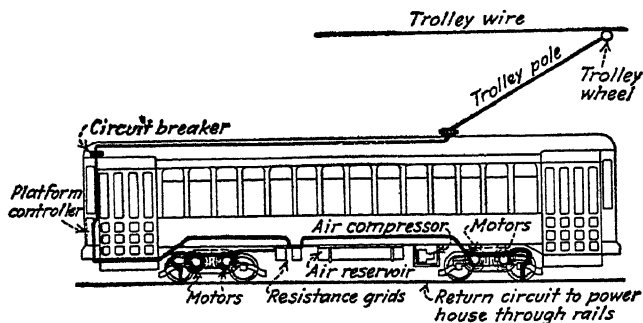


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mounted parallel to the axle and connected thereto through a double reduction gear. These motors also are fully spring supported and are connected to the gear through a flexible shaft. In both of these designs the flexible shaft is a vital element, in that it permits the motor to be carried on the truck frame which is spring supported from the axles and moves independently of them.

Development of Car Trucks.—Early rail cars, both for the steam railroads and for the street railways, followed the general design of their predecessors, the omnibuses and the stage coaches, except that flanged wheels were used in place of wheels with a flat surface. The double-truck design was not adopted by the street railways, however, until long after it had been introduced on the steam railroads. As car bodies became longer with more overhang outside the wheels, excessive oscillation resulted. To overcome this difficulty, truck frames were extended and elliptical springs were installed at the ends in addition to those between the axle bearing and the frame.

Car bodies continued to increase in length and weight, but because of the necessity to negotiate sharp curves, it was impracticable to increase the length of a 4-wheel truck sufficiently to support the body adequately. The electric railways then adopted the practice of the steam railroads in supporting the body on two 4-wheel trucks pivoted near the ends of the body. At first this type of truck was provided with one pair of large wheels driven by a single motor and a pair of smaller idle guiding wheels. This type of truck was introduced in 1891 and is still used to a limited extent. The tendency toward heavier cars caused the development of a two-motor truck with two sets of wheels of equal size. This type of truck is now generally used for both individual and multiple-unit electric cars.

Control Equipment of Electric Cars.—The purpose of control equipment on electric cars is to regulate the rate at which electrical energy is fed to the motors, beginning with a small amount when starting and gradually increasing until full power is delivered. The early electric cars had only one motor or two motors which were permanently connected in series, and the energy consumption was regulated simply by the introduction into the circuit of various amounts of resistance. In 1892 the Thomson-Houston Company developed the system of 'series-parallel' control, which is now generally used with both 2-motor and 4-motor cars. Platform controllers have been generally used for single cars since the earliest days of electric

railways. The ordinary platform controller consists of a rotating insulated cylinder, the surface of which supports a number of raised copper segments making contact with copper fingers projecting from an adjacent framework. As this cylinder is rotated in response to the movement of the operator's handle the various contacts between the copper strips and the fingers are made in succession. In first position all of the resistance is in circuit. In each subsequent position there is a smaller amount of resistance in circuit until the motors are in series across the line. The series connection is then broken and the motors are connected in parallel with resistance. This resistance is then cut out step by step until the motors are running in parallel without resistance. The resistances used in the motor circuit are usually made up of cast-iron grids placed side by side in a frame and connected together, each being separated from its neighbor to permit of free circulation of air.

The introduction of trains of motor cars on rapid transit and suburban electric lines necessitated the development of special control apparatus. The control of such trains differs considerably from that of a single car. Means must be provided to connect all of the motors on the train to the power supply at the same instant, so that a uniform starting effort may be had throughout the length of the train. The method which has been devised to accomplish this is known as 'multiple-unit' control. With the multiple-unit system, all the motors of the train are operated simultaneously through auxiliary circuits actuated by a master controller. Each motor car is equipped with one or two master controllers, and any one of those may be used, but in practice only the one at the head end of the train is so used.

Controllers for one-man street cars, and for rapid transit and electrified suburban trains, usually are equipped with a so-called 'dead-man's handle.' This is a device for automatically shutting off the supply of current to the motors in the event that the operator becomes incapacitated. It consists of a spring under the center of the control handle, which is pivoted at the end where it is attached to the vertical shaft. The weight of the operator's hand is sufficient to hold the spring in compression, but if he removes his hand at any time except when the controller is in the 'off' position, the spring raises the handle, thereby actuating a valve in the air piping with the result that the current is cut off and the brakes are applied automatically.

Brakes and Brake Rigging.—Braking de-

vices for electric cars are of three general types: (1) Wheel brakes or axle brakes, which retard the rotation of the wheels and axles by exerting frictional resistance on their surfaces; (2) track brakes which retard the forward movement of the vehicle by exerting frictional resistance on the head of the rail; (3) electric brakes which retard the rotation of the motor armature and hence through the gears retard the rotation of the wheels and axles. Of these types, wheel brakes are by far the most common. Most cars are equipped with both hand and air brakes. Compressed air for air braking systems is obtained from a storage reservoir which is kept filled by an electrically operated air compressor on the car. Track brakes have been used in various forms from the earliest days of electric railways. They are of two general types; those which retard the movement of the vehicle by exerting mechanical force on the rails and those which accomplish the same object by electro-magnetic force. Track brakes of the mechanical pressure type have never been widely used in the United States, although they are used to a considerable extent in England and elsewhere. Magnetic track brakes have also been used in various forms over a long period. In recent years they have gained some favor as a supplement to the ordinary type of wheel brake to obtain more rapid retardation. Electric brakes are of two types, regenerative and dynamic. In the first mentioned type the motor connections are changed so that instead of the motor propelling the car forward the motion of the car rotates the motor armature as a dynamo and energy is pumped back into the line. The dynamic type operates on somewhat the same principle, except that the motors are short circuited and are regenerative within themselves only, without pumping energy back into the line.

Current Collecting Devices.—To obtain current from the trolley wire or the third rail a rolling or sliding contact device is used. The ordinary street car uses a grooved wheel rotating at the end of a pole which is spring supported from the car roof at an angle of about 45 deg. In recent years there has been a trend toward the substitution of a sliding trolley shoe in place of the revolving wheel. When the sliding shoe is properly lubricated it is said to produce no greater frictional wear on the trolley wire than is caused by a wheel, and to maintain better contact. A type of contact device frequently used on street cars in Europe but seldom seen in America is the bow collector. This is a light framework supported on the roof of the car in much the same manner as a

trolley pole, but instead of being provided with a revolving wheel or sliding shoe it has a flat transverse contact surface which slides along the wire. The pantograph collector is a modification of this idea. It has a horizontal contact plate supported by a double diamond-shaped collapsible framework.

Third rail contact devices are all of the sliding type, but they are altogether different in design from the overhead sliding devices. In some instances they slide on the top surface of the contact rail, while in others they are spring supported against the under surface of the contact rail. In New York City and Washington where underground conduit construction is used in place of overhead trolley wire, each car is equipped with a plough projecting down into the slot. On the sides of the plough are spring contacts which slide along the faces of the parallel rails, one rail being the positive and the other the negative, both insulated from the ground.

Car Bodies.—Bodies of electric railway passenger cars have developed by a process of evolution from the bodies of horse cars and omnibuses. The earliest horse cars were nothing more than omnibuses on flanged wheels running on steel rails. As traffic increased this design proved unsatisfactory and a larger car body was developed consisting of a closed center compartment with an open platform at each end. The bodies of the early electric cars followed the standard body design of the horse cars. With the steadily increasing popularity of electric railway service, however, the limit of length of the car body which could be satisfactorily carried on a single four-wheel truck was soon reached. As a result, the double-truck car which had already been in use for many years on the steam railroads was introduced in modified form on the electric lines. Nowadays both single and double-truck cars are used by the electric railways, but the latter far outnumber the former. Car bodies are classified in a variety of ways. One major classification is based on the provision of equipment by which the car can be operated normally from either end, which is called a 'double-end' car. If control equipment, etc. is provided at only one end it is a 'single-end' car. Most of the early electric cars were of the double-end type. Fares were collected by hand by the conductor. In 1905 the 'pay-as-you-enter' method of fare collection was introduced in Montreal. It is now used almost universally in the United States and Canada, and has had a far reaching influence on car body design.

Numerous modifications of the original pay-as-you-enter plan have been made in recent years with consequent changes in door and platform arrangement. There are at present three general plans of door arrangement, which can be used either with single-end or double-end cars: (1) doors at both ends, (2) doors at front and center, but not at rear, (3) doors at front only.

The years following the World War saw the beginning of a return to one-man operation. Equipment had been developed which made it possible for one to operate a street car under normal conditions with as much speed and safety as a crew of two had done. This practice has now been extended to practically every city in the United States, and two-man cars are ordinarily used only on lines with extremely heavy traffic. Interurban cars are generally similar in design to those used in street railway service with the exception that they are larger and are capable of moving at higher speeds. Rapid transit subway and elevated lines such as are found in the larger cities, as New York, Chicago, Philadelphia, and Boston, also have cars larger than those used on surface lines. Theoretically there is no limit to the number of cars that can be operated in this manner, but in practice a nine- or ten-car train is seldom exceeded, the average length being somewhat less than this. In more recent designs the platforms and end doors have been eliminated and doors placed at intervals along the side of the car to expedite passenger interchange.

Prior to the World War, open cars were extensively used. When one-man operation came into vogue the use of open cars was largely discontinued, although some railways adopted the practice of screening the sides and arranging for the entrance and exit of passengers at the front end. Double deck cars are very popular in Great Britain but attempts to popularize them in the United States, particularly in New York and Pittsburgh, have not been successful.

Energy Supply System.—Furnishing electrical energy for the operation of electric rail cars involves three major steps: (1) generation, (2) conversion, and (3) distribution. Power generation for electric railways is substantially the same as for commercial purposes. The power generated is almost always high-voltage alternating current, 25 or 60 cycles. For the actual operation of street railway cars, direct current is used almost everywhere, usually at 500 to 600 volts. A few railroads operate at 600 to 750 volts and some are using 1500 volts or 3000 volts. Distribution of electrical energy for the

operation of the cars is through fixed conductors in close proximity and parallel to the running rail.

Overhead trolley wire is about $1/3$ to $1/2$ inch in diameter, of hard drawn copper or bronze. It may have a perfectly round cross-section, or it may have grooves at the sides for holding clips of the hangers. This trolley wire is suspended by copper 'ears' which are firmly clamped into the grooves at the sides or pressed closely around the wire in a manner that permits free passage of the trolley wheels along the under side of the wire. These 'ears' are in turn suspended by insulators from span wires running between supporting poles placed on opposite sides of the track. Brackets attached to poles adjacent to the track are used to a limited extent instead of span wires. The trolley wire is not continuous electrically but is divided into sections which are insulated from each other and fed separately from the substation. This precaution is important to limit the area affected by any trouble that may occur in the distribution system.

Third rail conductors are of two types: The over-running, with which the collecting shoes mounted on the motor cars slide along the top face of the rail; and the under-running, with which the contact shoes slide along the under surface, the rail itself being supported from above and the shoes held upward against it by spring tension. The overrunning rail is less expensive to install and is used altogether in elevated and subway surface. For elevated service it consists merely of an open rail supported every few feet on porcelain insulators on iron supports attached to the woodwork of the elevated structure. In subway service it is supported by similar porcelain insulators mounted on the ends of ties and arranged sometimes with a protection board located sufficiently above the surface of the rail to permit ample clearance for the passage of the contact shoes.

Electrolysis.—The majority of electric traction lines are operated upon what is known as a ground return, in which one side of the power circuit is grounded at the generating station or sub-station. The positive lines or feeders are well insulated from the ground, and these supply current to the trolley wires or third rails. An effort is made to induce the current to complete its circuit to the power house over the running rails by bonding one rail to another in order to reduce the resistance of the return circuit to a minimum. Frequently the track is not the shortest route between the power house and the point where the current is returned to

the running rails, in which event the current seeks other paths of lower resistance through the earth. Return current will follow water pipes, gas mains, lead-covered cables or any other metallic substance which serves to make easier its return to the power house. The result of this is that at points where the current passes from one of these conductors into damp soil, a corrosive action occurs which damages the pipe or cable. This corrosive action is known as electrolysis. All trolley bus operations, having no track, use double overhead wires.

Track Construction.—Design of the track structure was a simple problem in the early days of the electric railways. The horse car lines had already developed a simple and satisfactory design and in adapting it to electric operation it was necessary only to improve the electrical conductivity of the rails used for the return circuit to the power house. This was done by connecting the rail ends at the joints by copper bonds. In recent years the practice of welding the rail ends together has to some extent replaced the practice of bonding. Nearly all street railway track, however, is similar in essentials to the ordinary type of steam railroad track, familiar to all. On a foundation of hard earth a layer of broken stone ballast is laid, on which rest wood cross-ties supporting the rails. Sometimes the rails are the familiar T section, but for street railways they are more often of grooved section.

Early electric railways used a comparatively light type of track construction. As the weight of the cars became greater, a heavier design was found to be needed. This was attained through the use of concrete.

A particularly complicated phase of street railway track design is the special trackwork required at switches, crossings, etc. The usual custom is to employ special castings manufactured individually for each installation, rather than to assemble the crossing or switch from pieces of ordinary rail as is customary on steam railroads.

Railroad Electrification.—In the operation of urban and interurban electric railway service the individual electric rail car is the most important element. Multiple unit cars are used to some extent for these types of service, but their principal application is where an intensive suburban railroad service is given for comparatively short runs. Electric locomotives are used mainly to haul either passenger or freight trains through the electrified zone at the end of which electric and steam locomotives are interchanged.

Of outstanding importance in the field of electrification is the program undertaken by the Pennsylvania Railroad in 1929. This involves the extension of the Philadelphia electric zone from Wilmington to Washington on the south and from Frankford Junction northward to connect with the New York terminal zone. When the project has been completed trains will be operated by electric power all the way from New York to Washington. Electric locomotives will haul the through trains and multiple unit cars will be used for local service.

The reasons underlying these numerous electrifications are many and various. While electric operation is not necessarily cheaper than steam on a ton-mile basis, the other factors which enter the situation give electric operation decided economic advantages under many conditions. In suburban service the operation of multiple unit trains permits closer adjustment to traffic demands than is possible where trains are hauled by steam locomotives. Electric operation in terminal zones eliminates smoke and dirt and permits the tracks to be placed underground and the area above the tracks to be utilized for building purposes. Operation over heavy grades is facilitated by electrification because of the greater power of electric locomotives. Other advantages of electrification are increased schedule speeds due to faster acceleration and braking, greater flexibility due to the ability of electric locomotives and multiple unit cars to operate equally well in either direction, quicker availability for service because no time is required for getting up steam.

Energy Supply and Distribution.—While the energy supply and distribution systems for urban and interurban electric railways have become fairly well standardized throughout the United States, this condition has not existed in respect to electrified steam railroads. Engineering opinion has not been in agreement as to the relative advantages of alternating and direct current nor in regard to third rail and overhead distribution systems. Of late, however, the trend has been definitely toward overhead distribution. The latter permits the use of higher voltages with consequent economy in power distribution. It also eliminates difficulties with snow and ice on the third rail and reduces the danger of accidental grounding. Overhead contact lines are slightly more expensive to build than third rail contact lines, but the extra initial investment is largely offset by lower maintenance costs. In principle, overhead contact wires and heavy electric traction do not differ materially from those

used by the street and interurban railways except that the construction is heavier, and adapted to permit higher operating speeds. Both alternating current and direct current energy supply systems have proved entirely satisfactory. The high voltage alternating current system simplifies the problem of power distribution, and with transformer equipment on the rolling stock the motors are operated at voltages lower than that of the contact line. Use of direct current simplifies the design of rolling stock but necessitates a more complicated transmission system to feed the contact lines. The two schemes most generally favored at the present time are the 11,000 volt single phase alternating current and the 3000 volt direct current. It appears likely that the electrification projects undertaken in the near future will follow either one of these two systems.

Locomotives and Multiple Unit Cars.—For operation on electrified railroad systems the design of electric locomotives and multiple unit cars is similar in principle to that of urban and interurban electric rail cars. The special designs developed by the different railroads, however, vary greatly in detail. In general the electric locomotive drives are of two distinct types—geared and gearless. In the geared locomotives the motors may be mounted in a manner similar to that used on an electric car. A few designs have the motors mounted on the locomotive frame and connected through flexible links carried by the gears. Some of the gearless locomotives have the armatures mounted directly on the driving axles, the locomotive frame carrying the field coils. A modification of this design has the armatures carried on quills concentric with the axles and connected to them through springs. Still another type of gearless locomotive has the motors mounted in the cab and connected to the driving wheels by means of cranks and connecting rods. Multiple unit cars for electrified steam railroad service are heavier than those for street railway and rapid transit service, but do not differ greatly in other respects. For operation on alternating current systems both electric locomotives and multiple unit cars are equipped with alternating current motors and transformers to step down the high tension current to a suitable operating voltage.

The Trolley Bus.—For rendering service where traffic is comparatively light the 'trolley bus' has been developed in recent years. The trolley bus may best be described as a street car on rubber tires operating over ordinary pavement. The wheels are driven by small

high speed electric motors which derive their energy from overhead contact wires as do the motors of the trolley car. The control equipment for the motors is essentially the same as that for an electric rail car. The braking arrangement, on the other hand, resembles that of a gasoline motor bus. Since the vehicle operates without tracks it is provided with a steering mechanism, which also is similar to that of a gasoline motor bus. The absence of tracks necessitates the use of double trolley wire, one positive and one negative and double trolley poles on the vehicle. Its advantages are moderate initial cost, low operating cost, relatively high speeds and quiet operation.

Other Electric Vehicles.—Certain other vehicles, such as the electric storage battery car, the gasoline electric bus, the gasoline electric and the Diesel electric rail car utilize electric motors to drive their wheels. As they do not obtain their electrical energy from a remote generating station they should not be classified under the head of electric traction. The gasoline electric bus is a modification of the ordinary motor bus. Instead of having mechanical transmission of power from the engine to the wheels, this type of vehicle has a small electric generator connected to the engine to supply energy to electric motors which actuate the wheels. The gasoline electric rail car and the Diesel electric rail car are similar in principle to the gasoline electric bus, in that the engine drives a generator which supplies energy for the operation of motors geared to the wheels.

See ACCUMULATORS; DYNAMO AND MOTOR; RAILROADS; SUBWAYS.

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Electric Transmission. See **Electric Power Transmission**.

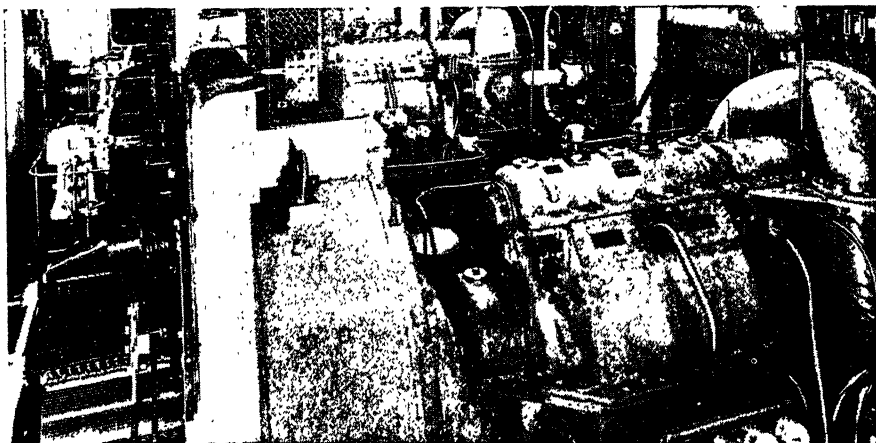
Electric Units. See **Units**; **Ampere**; **Coulomb**; **Dyne**; **Erg**; **Farad**; **Henry**; **Joule**; **Ohm**; **Volt**; **Watt**.

Electric Welding. See **Electrometallurgy**.

Electric Wiring of Houses. The three most important factors to consider when planning to wire a new house are (1) protection, (2) convenience or flexibility, and (3) economy

By protection is meant the safeguarding of life and property from accidental injury. The 'National Electrical Code,' used by the National Fire Protection Association, outlines certain specifications which must be adhered to if installations are to be approved by the local fire inspector or insurance issued by an insurance company. In addition, most progressive public utilities organizations require an inspection before making any service connection, that is, before supplying power to the consumer. One of the outstanding advantages of electricity is its flexibility of control. Another great advantage of electricity is its ease of application. By the use of combined wall, ceiling, and floor

(c) The branches are brought together at any convenient distribution point and attached to a larger wire known as a feeder, the point of attachment being near the electrical load centre. This distribution point is equipped with a switch for disconnecting power from the branch circuits, to facilitate alterations, and with larger fuses, the size depending upon the amount of current to pass through it. Most public utility companies require that the meter be placed on a board about three feet square, located near the point of entrance, in a dry place, free from vibration, and from 5 to 7 feet above the floor. The main switch and fuses are located on this board, also thus furnishing



Wide World Photo

Seven turbo generators, capable of delivering almost 10,000 kilowatts per hour, supply electric power aboard the Cunard White Star superliner, Queen Mary.

lamps, a room may be brilliantly illuminated on one occasion and only dimly lighted on another. In regard to economy, it is difficult to make specific recommendations on account of the variability of the cost of labor and material. A generous supply of lamps and outlets will usually pay ample dividends in the way of increased comfort and convenience.

In laying out a plan for house wiring the general method of procedure is as follows:

(a) Determine the size and location of the lamps desired (see ILLUMINATION).

(b) Allocate these lamps to various branch circuits, each branch carrying about 450 watts (which will allow for some expansion of load). Each branch should be equipped with a 10-ampere fuse, and the branches should be so located that the blowing of one branch fuse will not entirely disconnect power from any section of the house.

protection to both power company and consumer.

The size of wire depends upon the amount of current to be carried and the distance. It can easily be calculated from the distribution of the load and a knowledge of the resistances of the various sizes of wire. The allowable voltage drop, which for any size of wire is equal to the product of current by distance by the resistance per unit distance of that size of wire, must not exceed three volts under the most unfavorable conditions.

The actual wiring depends largely on the location. The insulation of the wire may be rubber-covered, slow-burning, or weatherproof, but the last is never used for interior wiring. The wires may be exposed and run on knobs, or they may be enclosed in any of several types of moulding or conduit. Both wires of a given circuit should be run in the same con-

duit. The main circuit should be equipped with fuse and switch, and each branch circuit should be independently fused. Any of the various fuses approved by the Code mentioned above may be used.

As its name implies, an electric circuit is a closed loop. The fuses are installed to open this loop automatically, and thus stop the flow of electric power, in case the current exceeds a predetermined limit. The loop or circuit may also be opened manually by switches. Switches designed to open one side of the circuit are known as 'single-pole' switches; those designed to open both sides as 'double-pole' switches. The switches which are inserted in a circuit should be carefully selected with regard to their ratings, with which they are usually stamped.

Electro-Chemistry, that branch of science and industry which deals with the effect on matter of the electric current and its production by chemical action. The subject may be roughly separated into three divisions, dealing with (1) electrolysis of salts in aqueous and non-aqueous solvents, (2) electrothermic reactions, *i.e.*, chemical changes produced by the high temperatures obtainable electrically, and (3) electronic phenomena produced by the ionization of gases by electric discharges.

Electrolysis has to do with the separation of the ions of compounds, and is applied industrially in the preparation and purification of metals, the electrodeposition of metals in thin coatings for protective or other purposes, the preparation of hydrogen, oxygen, alkali, and chlorine, and in electric cells and accumulators. Electrothermic processes depend upon the fact that higher temperatures can be produced more conveniently in the electric arc and by passing a current through resistance than by any other method. They are typified by the production of carbides, graphitic carbon, and carborundum. Electronic reactions depend upon the formation of ions in gases under the influence of electric discharges and are applied in the preparation of ozone. The discussion of electrochemical processes will here be confined to commercial applications.

Applications of Electrolysis.—The separation of ions by electrolysis may be accomplished in aqueous solution, in a bath of a fused salt, or in solution in some non-aqueous ionizing solvent, as liquid ammonia. Occasionally, for particular purposes, solutions of substances in some of the organic solvents, as alcohol, ether, and benzene, are introduced into electrolytic cells to accomplish particular reactions, but the resistance of such solutions is so high that

it is impracticable to conduct electrolysis in them.

A solution for electrolysis must contain a substance which is ionized; the passage of a current through such a solution results in the deposition of the positive ion (metal or hydrogen) on the cathode, where it loses its charge (acquires an electron), while the negative ion moves to the anode, where it loses its charge (loses an electron). This operation takes place without change, except of concentration, in the liquid unless other reactions occur between the solvent and the deposited ions. Frequently, such secondary reactions do occur, as in the electrolysis of a solution of sodium hydroxide (NaOH), where the sodium atom at the cathode decomposes water with the liberation of hydrogen, and the hydroxyl radical reacts with itself to form water at the anode with the liberation of oxygen.

According to Faraday's law, the quantity of an element deposited from solution by the passage of an electric current is strictly proportional to its equivalent weight and the quantity of current passed. One coulomb of electricity will deposit one gram atomic weight of a univalent element. In industrial practice, the secondary reactions which occur between the deposited ions and the solution may alter this considerably.

The electromotive force necessary to carry out a particular reaction depends upon the counter E.M.F. of the reaction (see ELECTROMOTIVE SERIES) and the resistance of the cell.

The nature of electrodes used and the construction of the cell itself depend entirely upon the purpose in view. The simplest cells are those used for the refining of metals, such as copper, by electrolysis. These consist simply of a bath of slightly acid copper solution in which are suspended a pure copper cathode and an impure copper anode. In operation the pure copper is plated out on the cathode and the anode is gradually dissolved. Where it is necessary to prevent the solution of the anode, as in the electrolysis of brine, this is made of some inert material such as carbon, graphite, or one of the noble metals. The cathode is not attacked in electrolytic operations and may be made of any convenient metal, or of graphite, if high temperatures, as in aluminum manufacture, would cause alloying with the deposited metal.

ELECTROLYSIS IN FUSED BATHS.—The preparation of a number of metals which cannot be produced by reduction with carbon is best carried out by the electrolysis of their fused salts. Sodium and potassium are thus electro-

lyzed from their fused hydroxides, and aluminum from a solution of its oxide in a fused bath of cryolite containing certain impurities to reduce its melting point.

The Acker process for the production of caustic soda and chlorine from fused salt is somewhat similar, except that the sodium is plated out on a cathode of molten lead, with which it alloys and from which it is removed by the injection of steam in a separate compartment. The chlorine released at the anode is drawn off by fans for use. The amalgam of sodium and lead formed at the cathode is run through a chamber beside the cell, where steam is blown through it. The steam is decomposed by the sodium to form sodium hydroxide and liberate hydrogen, which may be collected. The sodium hydroxide floats on top of the lead and may be run off continuously.

ELECTROLYSIS OF BRINE.—The problem of using a solution of salt instead of fused salt for the preparation of caustic soda and chlorine electrically is complicated by the secondary reactions involved. The sodium, as it is deposited on the cathode, decomposes water, with the liberation of hydrogen and the formation of sodium hydroxide. The chlorine liberated at the anode reacts further with this sodium hydroxide to form hypochlorite if contact between the two is permitted. In the cells used a variety of means are employed to prevent diffusion of the solution and to keep the hydrogen and chlorine separated. This is accomplished in the Castner-Kellner cell by the use of a mercury cathode, in much the same way that molten lead is used in the Acker process; in a number of others, by the use of diaphragms permeable to the solution; and in still others by the use of a bell.

OXYGEN AND HYDROGEN.—By the simple electrolysis of acidulated or alkaline water, oxygen and hydrogen are readily produced, the utility of the process depending entirely on the cost of power and the market price of the gases. The cells may be very simple in design provided the electrodes are kept close together to diminish resistance. Cast or wrought iron serves both as positive and negative electrode, since the iron of the positive electrode remains in the 'passive' state, probably coated with an invisibly thin layer of peroxide of iron, and dilute caustic soda (15 per cent.) or caustic potash forms the electrolyte. The gases may be collected in hoods or bells placed over the electrodes, drawn off to the pumps, and compressed into cylinders.

TANNING.—By the passage of a current of electricity through the tanning pits the liquor

—probably by the action known as endomosis—is caused to penetrate more rapidly into the hides, and the tanning is completed in a much shorter time than in the simple steeping process. It is said also to assist the chemical action, but the precise method of operation is somewhat obscure.

Electrothermic Processes.—The electric current may be used to produce high temperatures otherwise unattainable, by passage through an arc or a very high resistance. Many industrial processes are based on this fact. The manufacture of calcium carbide, graphite, carborundum, and alundum are carried out on a huge scale in electric resistance furnaces. Similarly the smelting and refining of iron and steel, particularly the alloy steels, the synthesis of rubies and sapphires, and in Norway, and to a less extent in America, the manufacture of nitric acid and its salts from the air are accomplished by the use of the electric arc.

The resistance furnace for the manufacture of the materials mentioned above consists of large graphite electrodes, between which is placed the mixture to be heated, which itself forms the resistor. Coke or anthracite coal containing 8 to 10 per cent. ash is used as the charge in a graphite furnace. Carborundum, largely used as an abrasive, is made by heating together sand and coke. Alundum is produced in a combination arc and resistance furnace by fusing alumina and coke so that the impurities present are largely reduced and separated from the alumina itself, which is sintered in the process.

The electric arc is used to furnish heat for the smelting and refining of metals and on a huge scale for the manufacture of special steels. A variety of furnaces are in use, all of which depend upon the striking of an arc between large graphite electrodes and the metal being treated. The temperature of the arc is above 3,000° C., and this furnishes heat for the melting and refining operations. Since the heat is released directly at the point of use, the furnaces can be built of insulating materials and with thick walls to conserve energy, so that little more is required than that necessary to carry out the desired reaction.

Calcium carbide is prepared in an arc furnace by heating together lime and coke. The furnace consists of a suitable receptacle for the lime and coke, provided with an outlet at the bottom, from which the fused calcium carbide may be withdrawn at intervals. The arcs for heating this furnace are struck between immense graphite electrodes suspended over the charge. Furnaces consuming twenty thou-

sand horse-power and turning out 11 pounds of 85 per cent. carbide per horse-power day are in common use.

Phosphorus and phosphoric acid are made in an electric arc furnace in large quantities by heating together phosphate rock (calcium phosphate), quartz sand, and coke. Elementary phosphorus is evolved from this reaction and may be oxidized to phosphorous pentoxide. A solution of the phosphorus pentoxide thus made in water is a very pure phosphoric acid and may be used to prepare phosphates.

Synthetic gems are prepared by the fusion of very pure alumina, to which proper impurities are added in the electric arc.

Production of Oxides of Nitrogen.—When air is forced into contact with an electric arc, it is raised to very high temperatures, at which the nitrogen and oxygen combine to some extent to form oxides of nitrogen. If the air is rapidly cooled after its contact with the arc, these oxides are not decomposed and may be collected by passing the air bearing them through water. In this way, a weak solution of nitric acid is formed, which may be concentrated or converted into its salts by alkali. In practice the alkali used is lime, and the product is sold for use as a fertilizer. The most successful of the applications of this process is that at Notodden, Norway, the so-called Birkland-Eyde process.

Electric Phenomena.—The production of ozone is typical of electric processes. The conversion of diatomic oxygen (O_2) to triatomic ozone (O_3) easily occurs in the presence of either a silent electric discharge or an arc. The reaction is endothermic and the ozone formed easily breaks down, yielding nascent, or atomic, and molecular oxygen, which accounts for its usefulness as an oxidizing agent.

The apparatus for the conversion of oxygen to ozone consists of two tubular electrodes separated by air. A high difference of potential is established between these two plates, although a spark is not struck, and a current of air passed between them. Ozone is used principally in the purification of drinking water, on account of its great chemical activity.

Atomic hydrogen, prepared by passing gaseous hydrogen through the very high temperature of an electric arc, has been shown to possess great possibilities, and efforts are being made to apply it industrially.

See ELECTRODEPOSITION; ELECTROLYSIS; ELECTROMETALLURGY; FURNACES, ELECTRIC; also ALKALIES; ALUMINUM; CARBIDES; CARBORUNDUM; NITROGEN.

Consult McMillan's *Electrometallurgy*

(1923); Allmand and Ellingham's *The Principles of Applied Electrochemistry* (1924); Blum and Hogaboom's *Principles of Electroplating and Electroforming* (1924); Creighton's *Principles of Electrochemistry* (1924); Langbein's *Electrodeposition of Metals* (trans. by Brandt, 1924); Thompson's *Theoretical and Applied Electrochemistry* (1924).

Electrochronograph. See **Chronograph.**

Electroculture of Plants, the stimulation of plant growth by means of an electric current or by the use of electric lights. In the use of the electric current, two methods are employed: (1) gathering atmospheric electricity and conducting it into the soil in which the plants are growing, and (2) using the current from a battery or dynamo. The first method makes use of masts, from four to six to the acre, carrying a metal plate (preferably insulated) at the top, with a fringe or crown of radiating wires or antennæ, which gather the electricity of the air. Wires are run from the plate to the ground, and in and out among the growing plants. The gain in the bulk of the crops thus treated has been estimated at from 9 to 11 per cent., with additional increased food value of 3 per cent. In the second method current from a battery or dynamo is used to stimulate the growing crop through a network of wires in the soil. By this means the yield has been increased from 50 to 70 per cent. in the case of vegetables, and 50 to 60 per cent. in that of grain.

The electric current from a battery has also been used upon seeds, which are first thoroughly wet, and then subjected in a mass to the action of a current, intermittently, for two or more days. The benefits observed have been more rapid germination (as much as 50 per cent. in time), a more thrifty development of the plant, and an augmented yield.

Numerous tests made to determine the value of electric light in accelerating the growth of vegetables and flowers seem to prove conclusively that its use greatly increases the size and hastens the maturity of the plants so treated.

Electrocution, the infliction of the death penalty by means of a high-voltage current of electricity passed through the body of the condemned. The advocates of electrocution maintain that it is a less revolting method of execution than hanging, for it is probably both instantaneous and painless. An alternating E.M.F. of about 1,600 volts is usually employed, and this is applied to the body of the convict through large electrodes thoroughly wet with either salt water or dilute alkali. One electrode

is applied to the head and the other to the calf of one leg. During the contact, lasting usually for about a minute, from seven to ten amperes enter the body.

Electrodeposition, the deposit of metal on a prepared surface by the electrolysis of a metallic solution. When a smooth deposit of a non-corrosive character is applied to the surface of a substance more easily corroded, or when thin films of metal are deposited to improve the appearance or produce a high lustre, the process is known as *electroplating*.

The conditions under which the electrodeposition of metals is carried on vary with the object to be attained. In electroplating, which has for its object the coating of a base metal with a metal of a non-corrodible character, or a more pleasing color, or one which is harder and more resistant to wear, or capable of taking a higher polish, the deposits may be exceedingly thin, since they are supported by the baser metal. They must be smooth, but the presence of impurities will be of slight consequence provided the color is not impaired. In electrotyping, on the other hand, the deposited metal is to be removed ultimately from its support, so that it must be of sufficient thickness and toughness to prevent distortion upon such removal. Special resistance to wear is also required, and as, after once covering the prepared surface, a smooth deposit is not essential, the means for producing a hard, strong deposit may be taken irrespective of the ultimate finish. In electrolytic refining, the purity of the deposit is the primary consideration.

Electroplating.—The first essential for good plating is a thoroughly clean surface, though the nature of the metals and the solutions used also have an important bearing. The preliminary cleaning may be carried out by purely mechanical processes, as sand-blasting, brushing, or scraping, generally followed by some chemical treatment, as with a hot alkaline solution to remove grease and an acid solution to remove the last traces of oxide. The actual plating is usually done in wooden tanks with a lead lining, though smaller ones of glazed earthenware are also used. They are arranged in parallel and fed by a low-voltage generator capable of supplying a large current. The objects to be plated are generally suspended by hooks from copper rods laid across the tank or, if they are small articles, are suspended in baskets. The current density is made as large as is consistent with obtaining a good deposit, varying widely according to the conditions. In ordinary plating the thickness of the deposit varies from a few thousandths of a millimeter

on cheap articles to a few tenths of a millimeter.

It is desirable that as many as possible of the following conditions be fulfilled in the case of solutions to be used. They should be (1) capable of easy preparation, and not liable to decomposition; (2) stable against the metals to be plated; (3) not subject to change on exposure to air; (4) of good conductivity; (5) possessed of cleansing properties, and therefore, capable of removing instantly stains or tarnish which may have been produced on the surface after cleansing, and prior to suspension in the bath; (6) without corrosive effect on the metal deposited, while (7) able easily to dissolve the anode under the influence of the current, and (8) able to yield a regular deposit.

Copper.—For copper-plating on brass (and other metals and alloys which do not deposit copper by simple immersion), for electrotyping on wax, gutta-percha, and various compositions, and for copper refining, copper sulphate is widely used, its solution being simple in composition, and not prone to much change. For most purposes 2 lbs. copper sulphate (crystals), $\frac{1}{2}$ pint sulphuric acid, 1 gal. water, makes a good solution, the presence of the acid greatly facilitating the passage of the current and improving the quality of the deposit.

Brass.—Brass plating is usually carried out to provide a surface upon which other metals can be deposited, but it is also used for brass deposition alone, notably in the case of some automobile fittings. The electrolyte used is a mixture of potassium zinc cyanide and potassium copper cyanide, and the brass deposit contains about 20 per cent. zinc and 80 per cent. copper.

Nickel.—Deposited nickel is exceedingly valuable on account of its extreme hardness, its stability against the action of air, and the fine polish which may be imparted to it. It can be used for coating practically all of the cheaper metals but in many cases only after a preliminary coating of copper has been applied. Formerly it was almost universally obtained from the following solution: 12 oz. nickel ammonium sulphate (double nickel salt), and one gal. water. The crystals are crushed and dissolved in warm water, and the solution made up to its proper bulk. A low acidity must be maintained to prevent contamination of the deposit with oxide. This is secured by the addition of boric or citric acids at the start and subsequent additions of small amounts of sulphuric acid.

Silver.—One of the best solutions may be made by dissolving 3 oz. fine grain silver in

nitric acid (one volume strong acid, one volume distilled water), evaporating to dryness, and redissolving the silver nitrate crystals in distilled water. To this a solution of good potassium cyanide is added in sufficient quantity to precipitate the whole of the silver as cyanide (white). The mother liquor is then poured off, and the precipitate washed several times with tap water, and finally dissolved in more cyanide solution. A further quantity of cyanide is now added, equal in quantity to that used in precipitating or redissolving the precipitate, and the solution made up to one gallon. Metals like lead, iron, or zinc should be first coated with copper in the cyanide solution previously given, and then treated as copper. Preparatory to silver deposition, the article to be plated is often immersed in a solution of mercury cyanide, made in a similar manner to the silver solution. This 'quicking' solution, as it is called, may also be easily made by dissolving 1 oz. mercury in nitric acid, evaporating to dryness to expel excess of acid, redissolving in water, and adding caustic soda solution to precipitate the oxide as an orange-colored powder. This powder is washed, and redissolved in an excess of cyanide, and made up to one gallon with water. The solution will then yield a bright coat of mercury, by simple immersion, to copper, brass, or German silver. The object of 'quicking' is threefold: (1) To render the surface less positive, and hence lessen the chance of silver being precipitated by simple immersion; (2) to prevent oxidation; (3) to act as a cement, binding the deposited silver to the surface upon which it is deposited.

Silver deposits may then be finished by any of the following processes: (1) *Burnishing*—imparting a fine luster, and at the same time hardening the deposit; (2) *scratch-brushing*—producing a pleasing effect on cast surfaces; (3) *'frosting'*—giving a peculiar frosted appearance by manipulating a long-haired revolving brush so that the ends of the wires cut the silver instead of merely rubbing it; (4) *oxidizing*—passing through a weak solution of ammonium sulphide or potassium sulphide (liver of sulphur), and scratch-brushing; or (5) the deposit may be left quite dead as it leaves the bath, but to obtain good results exceptional care must be taken not to rub the surface at all.

Gold.—Being an electro-negative metal, gold may readily be deposited from its solutions by simple immersion. Much gilding is done by this method, but the deposit thus obtained is very thin—little more than is necessary to impart a gold color to the article. For deposition by means of a current, a gold solution may be

made in a manner similar to that for silver. It must be remembered, however, that this metal is not attacked by nitric acid, and must therefore be dissolved in aqua regia (three parts hydrochloric acid to one part nitric acid). A solution may also be prepared electrolytically by passing a current through a solution of potassium cyanide, using a gold anode, and a small gold or platinum cathode, best placed in a porous cell, containing some of the cyanide, and standing in it.

Other Metals.—Zinc, platinum, cobalt, iron, tin, and lead are also electrodeposited. The galvanizing of iron objects is frequently accomplished by electrodeposition of the zinc. The bath used as an acid zinc sulphate solution and the coating produced is said to be superior to that obtained by hot galvanizing. Platinum plating is carried out in solutions of chloroplatinic acid or ammonium chloroplatinate, but difficulty is encountered in obtaining good deposits. Cobalt may be deposited under conditions similar to those used for nickel and though it has been stated to be more economical than nickel-plating, it has not been widely used. Recently worn-out or undersized parts of machinery have been successfully built up by the electrodeposition of iron. Tin and lead plating are practised to a limited extent for certain special purposes.

Very recently chromium plating has been successfully accomplished and is being rapidly developed as it furnishes a coating which is unusually hard and durable as well as being very resistant to the action of acids. Briefly, the process consists of the electrolysis of a solution of chromic acid with additions of chromium salts, the sulphate of chromium being used frequently. The anode is of lead, and the article to be plated is the cathode. The exact nature of the chemical action is not well understood. Chromium is plated on the cathode and oxygen is evolved on the anode. Chromium can be deposited directly upon copper, nickel, cobalt, brass, steel, and other metals. In practice, however, chromium plating of iron and steel is usually preceded by a copper or nickel plating to insure an even, heavy deposit.

Electrotyping.—The process of electrotyping has for its object the reproduction of type, engravings, or metals; and in addition the production of various articles such as seamless tubing. The electrotype may consist of copper, nickel, or iron but the first-named metal is most generally used. A mould or negative cast of the object to be reproduced is first made from a suitable wax composition, but

this cannot be made to receive a deposit of metal until the surface is made conducting. This is accomplished by thoroughly brushing the surface with graphite. The mould is then made the cathode in an electroplating bath by clamping a copper lead to the edge of the graphited surface. To produce the relatively thick deposit necessary for electrotypes, the electrolyte consists of a copper sulphate solution acidulated with sulphuric acid.

Electrodes. See **Electro-chemistry: Electrolysis.**

Electrokinetics. See **Electricity, Current.**

Electrolysis. Substances which conduct the electric current may be divided into two general classes: (1) metallic or electronic conductors and (2) electrolytic conductors. The metals and their alloys and a few other substances, such as carbon, constitute the first class; the second type of electrical conductivity is exhibited by solutions of acids and salts and by most molten salts. The passage of the electric current through an electrolytic conductor is known as electrolysis, and the dissolved or molten substance which forms the conductor is termed an electrolyte.

The phenomenon of electrolysis may be readily demonstrated by immersing two pieces of silver in a solution of copper sulphate and connecting them to the poles of a dry cell. In a short time a deposit of copper appears on the silver and an ammeter in the circuit will indicate that a current is passing.

Products of Electrolysis.—The conductors which convey the current to the solution, as the pieces of silver in the experiment just mentioned, are called *electrodes*; the electrode connected to the positive pole of the cell the *anode*, and that attached to the negative pole the *cathode*. During the passage of the electric current through an electrolytic conductor the constituents of the electrolyte move through the solution (or fused salt) and are liberated at the electrodes. The charged particles which move through the solution under the influence of the electric field are called *ions*, those moving toward the anode being designated *anions* and the others *cations*.

Laws of Electrolysis.—Michael Faraday in 1833 enunciated the two well known laws of electrolysis which bear his name. According to the first of these laws the quantities of substances set free at the electrodes are directly proportional to the quantity of electricity that passes through the solution. This means that if five coulombs of electricity deposit a certain weight of silver on the cathode, then ten

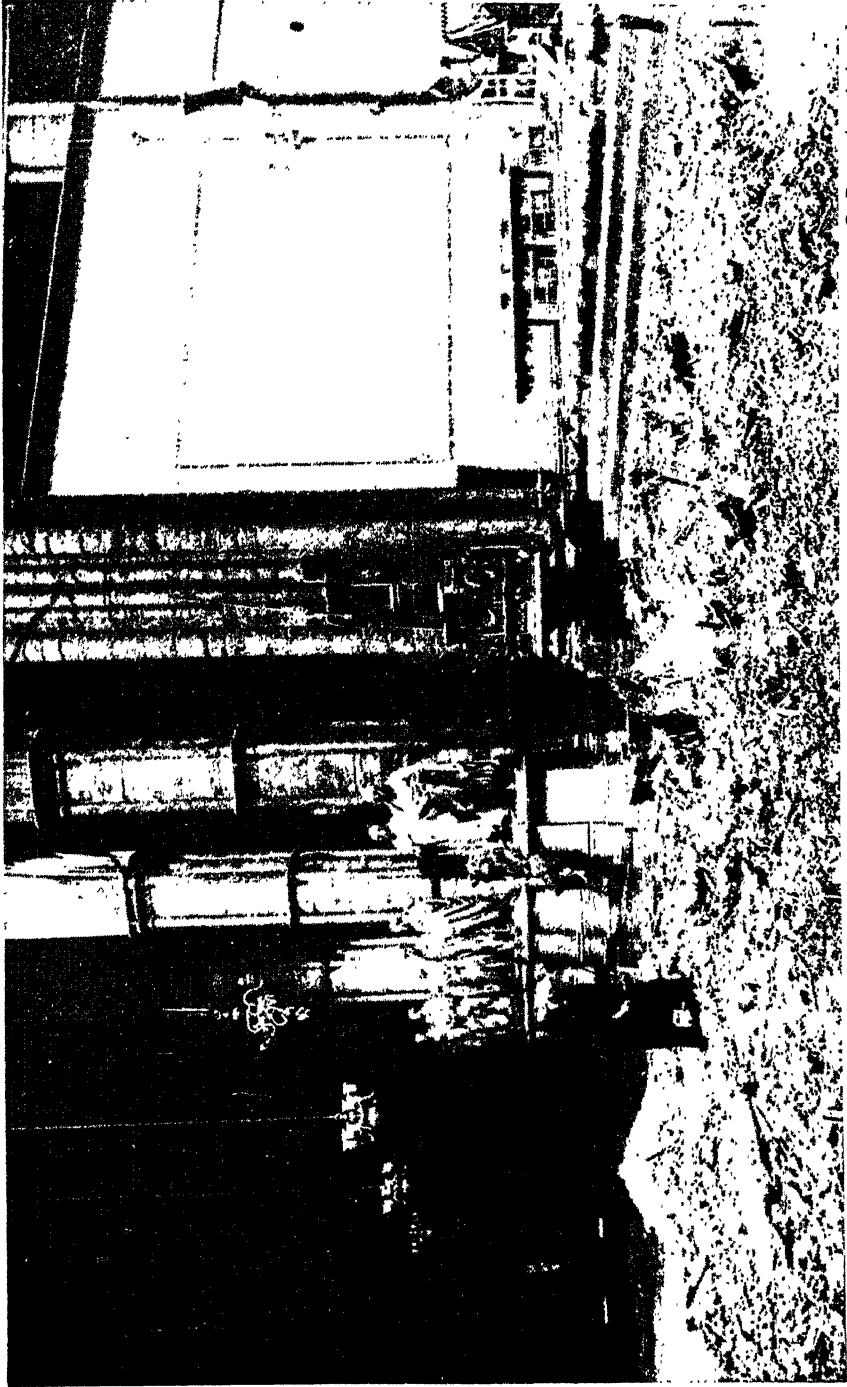
coulombs will deposit double this amount regardless of the variation in other factors such as the temperature and the concentration. The second law states that the same quantity of electricity passing through different solutions will liberate the various substances at the electrodes in the proportion of their chemical equivalents. This means that the quantity of electricity which liberates 1.008 grams of hydrogen will set free 16 grams of oxygen, 107.88 grams of silver, 31.8 grams of copper, etc.

Theory of Electrolytic Conduction.—The Swedish physicist, Arrhenius, put forth his now famous 'electrolytic dissociation theory' in 1887. This theory with some modifications and additions forms the basis of the modern explanation of the phenomena of electrolysis. According to this theory, the substances that are electrolytic are split up or dissociated into positively and negatively charged particles when dissolved in water. Thus a salt like sodium chloride breaks up, on solution, into positive sodium ions and negative chlorine ions.

It is evident that under the influence of an electric field, the positive ions will move toward the negative electrode and the negative ions toward the positive electrode, all the ions in the solution participating in this motion which constitutes the electric current. When a cation comes in contact with the cathode, its positive charge is neutralized by acquiring an electron and it is then liberated as a neutral atom or group of atoms. When an anion comes in contact with the anode, it gives up an electron and likewise becomes a neutral atom. The accumulation of electrons on the anode and the depletion of electrons from the cathode are, of course, prevented by the flow of electricity in the external circuit which is being produced by a cell or a generator. The charge on a single ion, such as the hydrogen ion, is the same as the ultimate electric unit, the electron, and is equal to 1.59×10^{-19} coulombs; the charge on all ions is either equal to this or a simple multiple of it.

Conductivity of Electrolytes.—Whereas one speaks of the resistance of metallic conductors in the case of electrolytics, it is more convenient to deal with conductivity, which is the reciprocal of resistance. Conductivity depends mainly on the nature of the electrolyte, its concentration in the solution, and the temperature.

Polarization.—If a solution of sulphuric acid is electrolyzed using smooth platinum electrodes and an E.M.F. of about one volt, a current will flow at first then rapidly decrease in strength, and finally cease. If the battery



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Westminster Abbey, a British Shrine, where Kings and Queens of England have been crowned, hit by bombs.

is removed from the circuit and the circuit completed by a wire, a current will flow in the opposite direction, showing that a counter E.M.F. has been built up in the circuit. If the E.M.F. is raised above a certain value, in this case about 1.7 volts, the current can be made to flow continuously. This phenomenon, known as polarization, is of very general occurrence in electrolysis and may be stated to be due, in general, to a counter electromotive force caused either by exhaustion of the substances used in the electrolytic reaction occurring more rapidly than they can be replaced or by the accumulation of the products of the reaction faster than they can be removed.

Technical Applications.—Electrolysis is of enormous industrial importance. It is widely used in electroplating and electrotyping (see ELECTRODEPOSITION), in the extraction of a number of metals from their ores, and in the refining of metals (see ELECTROMETALLURGY). The world's supply of aluminum, as well as of other metals of lesser importance, as sodium, magnesium, and calcium, is produced solely by electrolysis. The process is also used for the production of many other important substances widely used in industry, as caustic soda, chlorine, hydrogen, oxygen, hypochlorites, chlorates, and, more recently, certain organic compounds. See ELECTROCHEMISTRY. Consult Creighton and Fink's *Electrochemistry*; Allmand and Ellingham's *Applied Electrochemistry*.

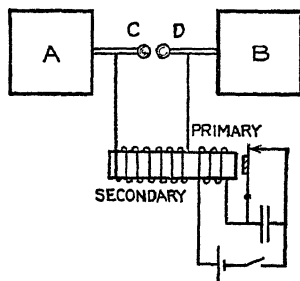
Electrolytic Cells. See **Electrochemistry**; **Electrolysis**.

Electromagnetic Induction. See **Electricity**, **Current**.

Electromagnetic Waves.—Faraday, in 1845, with his conception of curved lines of electric force and his confident belief that Huygen's wave theory of light was applicable to the propagation of electric energy, undertook to prove experimentally that the laws of action of light phenomena and electric phenomena were the same. With Faraday's conceptions and experimental researches as a basis, Maxwell (1861), in a brilliant mathematical paper, presented his 'electromagnetic theory of light,' in which he showed the possibility of the propagation of electric energy and predicted that its velocity of propagation would be the same as that of light.

Hertz (1888) furnished the experimental proof of Maxwell's theory. He produced very rapidly oscillating currents by means of a condenser discharge in a circuit similar to that shown in Fig. 1, in which the condenser plates A and B, about 40 centimeters on a side and

separated by about 60 centimeters, are connected to the secondary winding of a step-up induction coil across which is placed a spark gap CD. In order to have oscillations there must be a transfer of energy from the electrostatic form to magnetic and vice versa.



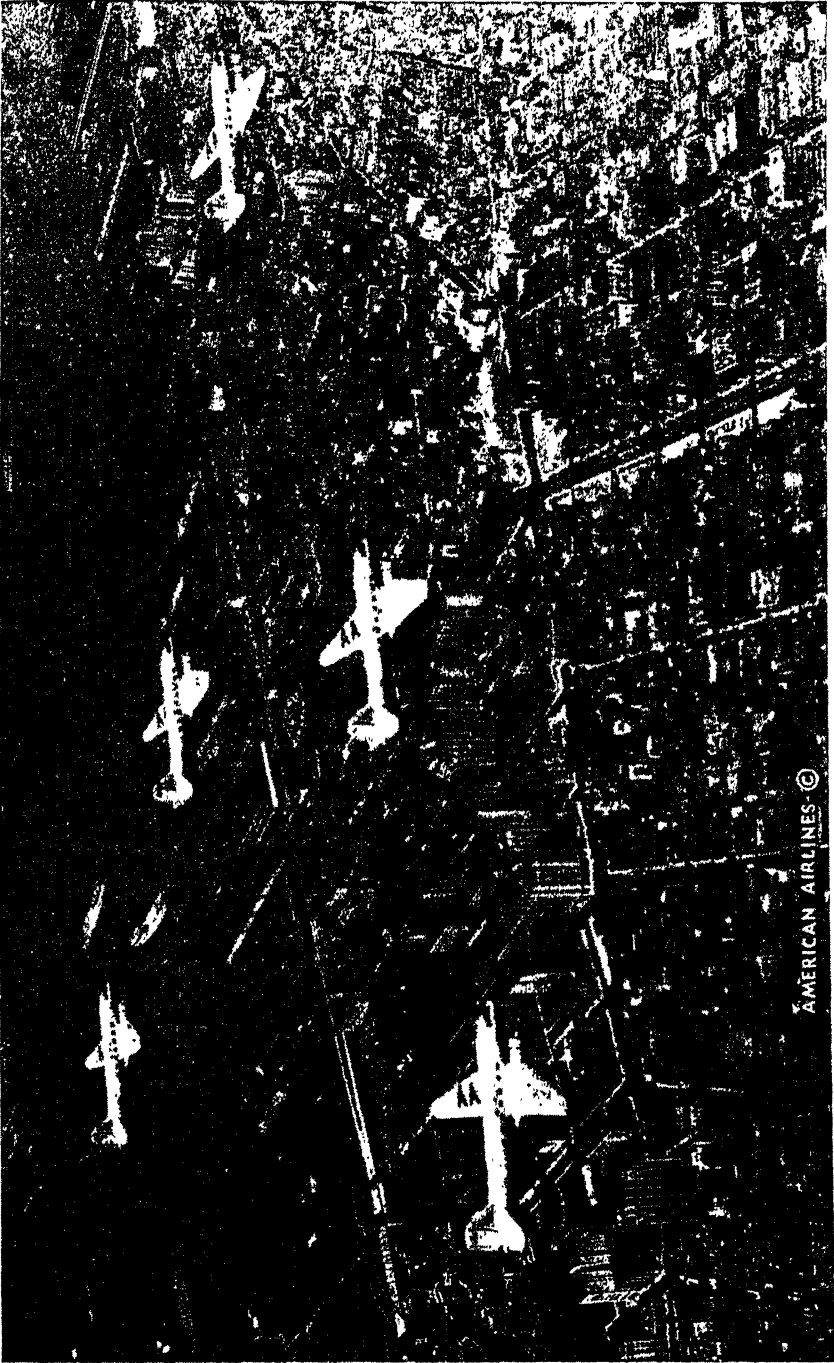
Electromagnetic Waves. Fig. 1.

The number of wave trains depends upon the mechanical frequency of the vibrator and in general will not exceed a few hundred at most. This leaves large intervals between wave trains when no energy is being radiated, which necessarily reduces the effectiveness of the system. The wave trains should be close together so as to obtain a large cumulative effect.

The power input that can be handled by the system shown in Fig. 1 is limited to 200 or 250 watts as a maximum, but Fleming showed that the average rate at which one of Hertz' oscillators gave up its energy was of the order of thirty kilowatts during the first ten cycles of a wave 4.8 meters in length—that is, a frequency of sixty-six million cycles per second.

From this brief discussion it will be seen that the circuit used by Hertz was not particularly well adapted for producing electric waves of great intensity required to radiate appreciable energy of great distances. It was effective, however, in establishing experimentally important fundamental principles regarding the propagation of electromagnetic waves and for this reason is a worthy subject for study.

An electromagnetic wave consists of a magnetic field and an electrostatic field moving along together and mutually sustaining each other. One of the fundamental principles of electrical engineering is that a varying magnetic field (current) induces an electromotive force; another fundamental principle is that a varying electrostatic field (voltage) in a dielectric produces a current. The two fields are at right angles to each other and to the direction of propagation. The energy of the magnetic



The symbolic V—for Victory—flew across the New York City skies as five American Airlines Flagships in V-formation thundered a powerful message to New York citizens to aid the nationwide aluminum drive.

field in ergs per cubic centimeter is equal to $H^2/8\pi$ where H is expressed in lines of force per square centimeter. The energy of the electric field in ergs per cubic centimeter is

$$= \frac{E^2}{2.262 \times 10^{10}}$$

where E is expressed in volts per centimeter. In a pure wave the energy of the magnetic field is equal to the energy of the electrostatic field. At a point in space where one is intense the other is also.

In some of the recent high-frequency short-wave experiments, the waves have been directed away from the earth at a predetermined angle in very much the same manner as an artillery man fires a long-range gun. When the wave strikes the Kennelly-Heaviside layer, it is reflected towards the earth and may strike it at a point hundreds of miles or even several thousands of miles from the transmitting station. There may be long distances between the sending station and a receiving station where the signal intensity is great, over which the signal is absolutely zero so far as ordinary receiving equipment is concerned.

Bibliography.—Consult Faraday's *Experimental Research*; Maxwell's *Electricity and Magnetism*; Hertz' *Electric Waves*; Lodge's *Signaling Across Space without Wires*; Fleming's *Electric Wave Telegraphy and Telephony*; Heaviside's *Electromagnetic Theory*; Collins' *Wireless Telegraphy*; Franklin's *Electric Waves*; Kennelly's *Hyperbolic Function Applied to Electrical Engineering* (1916).

Electrometallurgy, that branch of metallurgy which uses electrical energy wholly or in part for the production and treatment of metals (Hofman). Electrometallurgy received its impetus from the first successful dynamos (1860-70), which afforded a much cheaper source of power than was previously available, and has experienced a rapid growth in the last quarter of a century.

Extraction and Refining of Metals by Electrolysis.—Metals are extracted or refined (1) by electrolysis from aqueous solutions and (2) by electrolysis of a fused compound. Among the first are copper, zinc, nickel, cobalt, silver, and gold; among the second, aluminum, sodium, and magnesium.

ELECTROLYSIS FROM AQUEOUS SOLUTION: Copper.—Up to recent times the extraction of copper from its ores by electrolytic methods had not been widely used, for although it was metallurgically possible, it had not seemed economically advisable. To-day, however, some plants are leaching low grade ores and extracting the copper by electrolysis on a 'on-

nage basis, using insoluble anodes. The process is cyclic, the spent electrolyte being used in leaching.

Most crude copper is refined by electrolysis. By this process, not only is a very pure grade of copper suitable for electrical uses obtained, but the precious metals, gold and silver, are recovered from the crude metal. The blister copper is received in the tank house in the form of cast anodes, containing 98 to 99.5 per cent. copper, mixed with varying amounts of gold, silver, lead, bismuth, tin, zinc, iron, and other metals. The cathodes consist of starting sheets of pure copper. The anodes and cathodes are placed alternately in the tanks, with one more cathode than anode. During electrolysis, the current dissolves copper from the anode and deposits pure copper from the solution on the cathode. The electrolyte consists of a solution containing usually about 16 per cent. CuSO_4 and 12 per cent. free H_2SO_4 .

Zinc.—At the present time zinc is successfully extracted electrolytically on a commercial scale. The concentrates are roasted so as to form zinc sulphate. The ore may then be leached with a sulphuric acid solution (10 per cent.) at the start; subsequent leaching may be effected with the electrolyte, which becomes acid after use. The leached solution is subjected to electrolysis, with insoluble anodes, in cells of wood lined with lead. The anodes are of lead with copper contacts, and the cathode starting sheets are of aluminum.

ELECTROLYSIS USING FUSED ELECTROLYTES:—Aluminum.—The aluminum industry is dependent entirely on electrolytic methods for the production of the metal. The process of extraction is known as the Hall process, and depends on the electrolysis of a fused electrolyte. The current is used not only for electrolysis but also to fuse the solid material and to maintain it in the fused state during electrolysis.

Sodium.—Most of the sodium produced is obtained by Castner's process in which fused caustic soda is electrolyzed, sodium being deposited at the cathode and oxygen at the anode. The Castner cell consists of a cast iron vessel into which an iron cathode, insulated by porcelain, is luted by fused caustic soda. The anode, in the form of a ring, made of nickel and perforated, is suitably insulated from the vessel. A nickel wire gauze above the cathode and dipping into the electrolyte retains the sodium liberated at the cathode as it rises to the surface.

Magnesium.—Magnesium is produced by electrolysis of a fused double chloride of mag-

nesium and potassium (carnallite), the temperature of the electrolyte being maintained between 650°C . and 700°C . During electrolysis, chlorine is liberated at the anode and magnesium at the carbon cathode. Magnesium (molten), being of lower specific gravity than the electrolyte, floats to the top of the bath under a porcelain hood surrounding the cathode and open at the bottom. This is necessary to prevent it from interacting with the chlorine which is constantly liberated at the anode. A stream of inert gas is used to sweep out chlorine.

Calcium is also prepared by electrolysis from a fused salt, usually calcium chloride.

Electroplating.—The most extensive use of the electrolytic cell is in electroplating, in which a thin layer of metal is deposited on another metal for protective (zinc) or ornamental (silver) reasons or both (nickel). Some of the metals used are nickel, gold, silver, copper, zinc, lead, cobalt, iron, and chromium. Brass is also used extensively. The article to be plated forms the cathode, the anode and solution vary with the metal to be deposited. See ELECTRODEPOSITION; ELECTROLYSIS.

Electric Furnaces.—There are many varieties of electric furnaces on the market for making alloys and producing metals, but all may be classified, according to the method of heating by electricity, as (1) resistance-heating; (2) induction-heating (a special form of resistance-heating); or (3) arc-heating.

In *resistance furnaces* the heat is generated by the resistance offered to the passage of an electric current through the resistor material, which may be either a solid metal or special alloy or carbon. Carbon, then, either in the massive form or granular, is the best resistor known at the present time for furnace construction. In the electrometallurgical industries resistance furnaces have only a limited use, as the temperature obtainable is limited by the life of the resistor material.

In an *induction furnace* the metal to be heated forms the resistor material, so that this is really a special form of resistor heating. If an electrical conductor lies in the magnetic field of another conductor carrying a current, a current will be induced in the second conductor. By this method enough heat can be produced to melt metals and to make alloys. The temperatures produced are not high enough to melt iron for steel manufacture, but are high enough to be used in some non-ferrous alloy mills. The most notable use of the inductive principle in the electrometal-

lurgical industries is in the manufacture of brass.

The *arc furnace* is the type of electric furnace having the most varied uses in the electrometallurgical industries. This is due to the great flexibility of its temperature range and its adaptability to almost all types of metals and alloys. Its chief development has been in connection with the manufacture of electric steel. The advantage of electric furnaces for making steel is that with proper handling a very high grade steel can be made in fairly large tonnages. At the present time good electric steel compares favorably with the best grades of crucible steels.

Electrowelding is the practice of joining together metals or alloys by means of an actual melting of the metal at the place to be joined by means of an electric current. The heat necessary to do this may be obtained by direct arcs or by resistance heating.

In the original Zerner process of *arc welding* two carbon electrodes were held at convenient angles and the arc between was directed down onto the metal to be melted by a strong electromagnet. To-day arc welding is almost universally done by means of a single electrode.

The Slavianoff method uses the direct arc with a metallic electrode in place of carbon. By this method the electrode itself melts, thus giving the additional metal for the weld; this does away with the rod of metal used by the other process. The Strohmenger-Slaughter method, which uses a covered metallic electrode, is the same as the Slavianoff process except that the covering prevents excessive oxidation of the molten metal. Furthermore, this method can use either direct or alternating current.

The electric arc has a wide-spread use in the metal trades to-day. It is used in many hand operations, such as cutting and adding metal to metal. Most machine welding is done by means of resistance heating units.

Resistance welding is of several types: (1) butt welding; (2) spot welding; (3) seam welding; (4) mash welding (crossed wires); (5) percussive welding.

In *butt welding* an alternating current is generally used, of any commercial frequency. The material to be welded is clamped in two copper electrodes, generally water-cooled, and the ends are brought together. The current is turned on and considerable pressure is applied to the pieces. The resistance made by the ends produces enough heat to melt the metal, thus forming the union.

Spot welding is accomplished by pressing the two metals to be welded together, between two copper electrodes, and turning on the current. The resistance offered by the material is sufficient to melt it and the pressure applied by means of hand or foot levers is sufficient to form a good welding.

Seam welding is a special variation of spot welding. The only difference is that in the former the spot is lengthened out into a line and long lengths can be joined together along their edges. Fluxes may be used to prevent oxidation of the molten metal.

Electrometer (ELECTROSTATIC ELECTROMETERS and ELECTROSTATIC VOLTMETERS). An electrometer is any instrument for measuring potential, or rather difference of potential (P.D.). The term is, moreover, restricted to instruments which measure P.D.'s by means of static charges, and not by currents. In this respect the word voltmeter is a more general term, including, as it does, both electrostatic and current instruments (see VOLTMETER). A further distinction is that the name voltmeter is used only of instruments which are suitable to ordinary electrical engineering practice; they must be comparatively simple and portable, and must be adapted for measuring the (comparatively) low voltages occurring in engineering applications.

Electromotive Force. See **Electricity, Current; Volt; etc.**

Electromotive Series, an arrangement of the elements in the order of their electric potentials in normal solutions of their salts. The order in which they appear in the series is an indication of the readiness with which they lose electrons to form ions. The potentials indicated are those which would be developed between two electrodes, one of the element in question and the other of hydrogen, when forming an electric cell by immersion in a normal solution. In other words, it is possible from such a table to calculate the theoretical voltage produced by a cell made up of any two elements by taking the algebraic difference between their potentials. The table is further useful in showing whether or not an element will be replaced in solution by another suspended in it, in the same way that copper may be plated out of its solution by suspending iron in it. Those elements placed before hydrogen in the series dissolve in acids with the evolution of hydrogen, but those following are only to be dissolved in acids in the presence of oxidizing agents.

Electron, or Electrion. When an electrolyte is being decomposed by an electric cur-

Element	Potential in Volts
Lithium.....	—2.96
Potassium.....	—2.93
Rugidium.....	—2.92
Barium.....	—2.8
Sodium.....	—2.72
Strontium.....	—2.7
Calcium.....	—2.5
Magnesium.....	—1.55
Aluminum.....	—1.34
Manganese (Mn+++).	—1.00
Zinc.....	—0.76
Chromium (Cr+++).	—0.5
Iron (Fe++).....	—0.44
Cadmium.....	—0.40
Cobalt (Co++).....	—0.29
Nickel (Ni++).....	—0.22
Tin (Sn++).....	—0.14
Lead.....	—0.13
Iron (Fe++).....	—0.04
Hydrogen.....	0.00
Antimony (Sb+++).	+0.1
Bismuth (Bi+++).	+0.2
Arsenic (As+++).	+0.3
Copper (Cu++).....	+0.35
Indium (In+++).	+0.35
Oxygen (OH—).	+0.41
Copper (Cu+).	+0.47
Mercury (Hg+).	+0.8
Silver.....	+0.8
Palladium (Pd++).....	+0.82
Mercury (Hg++).....	+0.86
Gold (Au+++).	+1.3
Gold (Au+).	+1.5

rent, the process by which the electricity is conveyed is believed to be one of convection. There is going on in the fluid continual dissociation of the molecules into two oppositely charged parts called the ions. When an external electromotive force acts, the positively charged ions pass one way, the negatively charged the other; any one ion being sometimes combined with an ion of the opposite kind so as to form a neutral molecule, at other times being free (see ELECTROLYSIS). When electricity is passed through a gas, certain remarkable phenomena are observed which may be coordinated by means of a 'dissociation' theory very similar to the electrolytic theory. The molecules of the gas are supposed to suffice, dissociation; and many curious phenomena associated with the cathode rays—i.e. the streams of negatively charged corpuscles driven off from the cathode—indicate that the negatively charged portion of the dissociated molecule, the so-called negative electron, has a

mass of about the thousandth part of the mass of a hydrogen molecule. The radius of the negative electron is but 2×10^{-13} cm., while the radius of the positive electron is two thousand times greater, or about one twenty-fifth of the radius of the atom.

When a neutral molecule breaks up into a negative electron of small mass and a positive electron of comparatively large mass, the former moves off with a correspondingly greater velocity. By an ingenious extension of this theory, J. J. Thomson has explained the flow of electricity in simple conductors as a convection of negative charge by means of these electrons or corpuscles. Not only so, but he has shown that many electrical phenomena can be coördinated in terms of this hypothesis, which, by suggesting new lines of research, has led to corroborative results of great novelty and interest.

The physicists have shown that the atom is built up of positive and negative electrons. The nucleus of the atom contains a number of free positive electrons corresponding to the number assigned to that atom in Moseley's table. A corresponding number of free electrons are in the outer regions of the atom. There are probably other positive and negative electrons in the nucleus. The negative electrons in the outer regions are generally conceded to be traveling in orbits, so that the atom represents a system similar to our solar system in relative magnitudes and motions. See VACUUM TUBES. Consult R. A. Millikan's *The Electron*.

The study of electronic collision with matter was first begun by Prof. P. Lenard. Professors Max Born of Cambridge University and E. Schroedinger of Oxford University evolved a theory in 1936 by means of which the size of the electron can be multiplied 10 times. Overbeck, *The New Light*, 1936.

Electronic Devices—photo-electric cells, grid-glow cells, and vacuum tubes—are those devices that endow automatic machines with almost human attributes, as hearing, smelling, feeling, seeing. See *The Electric Eye* (p. 1611). RADAR, and VACUUM TUBES.

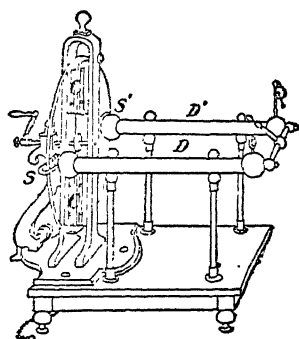
Electrophorus. See **Electrostatic Machines**.

Electroplating. See **Electrodeposition**.

Electrostatic Machines. Electrical machines may be defined as devices by which mechanical work can be converted into electrical energy. They consequently deliver electricity at a more or less high potential. They may be divided readily into two classes: (1) Ordinary electrostatic machines, which pro-

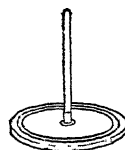
duce comparatively small statical charges at very high potentials; (2) commercial dynamo-electric machinery which affords comparatively large supplies of electricity, always in the kinetic form as a current, and at potentials low compared with those produced by the former class of machines. In this article electrostatic machines alone are considered.

The simplest and earliest form of electrostatic machine is the frictional machine.



Electrostatic Machine. Fig. 1.

Glass is now used in all forms of frictional machine, and may be either in the form of a disc, or less commonly, of a cylinder. A disc machine is shown in the diagram (Fig. 1). If only one rubber and collector pair were used, these would be at 180° apart. Most commonly, however, two pairs are employed, and the parts come in intervals of 90° , as in this illustration. The combs *ss'* embrace the glass on both sides, but are connected electrically by means of the large metal prime conductor *dd'*.

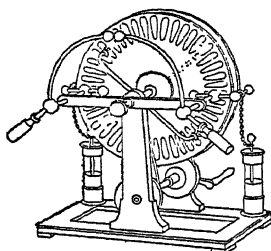


The Electrophorus. Fig. 2.

The charge of electricity is to be produced on this conductor, and so the whole conductor *sdd's'* is well insulated by being mounted on tall glass rods. Similarly, the rubbers *cc* clasp the glass firmly on both sides, and are connected by strips of metal, usually tinfoil. Frictional machines are seldom used in practice, and are almost entirely replaced by various forms of induction instruments.

The Electrophorus.—When a small charge is required, nothing can be more satisfactory

than this simple instrument. It consists of two discs, a thin brass one with glass handle, and resting on a similar disc of hard rubber (Fig. 2). The latter is usually backed on the lower surface with tinfoil, forming a sort of condenser, which thus retains its charge longer. The hard rubber is charged by rubbing with fur, and this comparatively small charge may be used to collect + electricity, theoretically without any of the initial charge being used up, and practically with no other limit than the time in which the — charge gradually leaks away. The brass disc is meanwhile some distance off; it is brought up, held by the glass handle, laid on the hard rubber, connected momentarily to earth and removed by the glass handle. The brass will now be found to have a + charge, which may be stored up on a conductor, and the cycle repeated.



Wimshurst's Machine. Fig. 3.

Wimshurst's Machine.—This is the form of influence machine which is most commonly used. (Fig. 3.) Two similar glass plates are mounted on the same spindle, and by crossing one of the belts, are made to revolve in opposite directions. On either side is a diametral conductor, provided with tinsel brushes, which touch, or almost touch, the plates. On the outer side of each plate are pasted a number of tinfoil strips. A pair of combs embrace the two plates, and are connected to the two poles, the balls in the upper foreground. The Leyden jars are not necessary, but, as in all machines, they increase the capacity of the prime conductors, causing brighter though less frequent discharges. Two points must be observed in the working of a Wimshurst. (1.) The direction of rotation must be such that, after a section has passed underneath a comb, it must, after about 45° revolution (an acute angle at least), pass under a brush. Hence the two diametral conductors form a cross of about 90° angle, as indicated in the figure. (2.) The machine will not self-excite if the poles are initially at the same potential. If the balls be separated, however, there will generally be a

sufficient p.d. to start the action. Let us suppose it is started by holding electrified rubber beyond the farther plate, and just behind the upper brush of the diametral conductor on this side (top left-hand corner behind). Positive electricity attracted to the tinsel brush will be showered on to the sectors on the nearer plate as they travel to the right. The obtuse angle of the nearer plate lying between the upper brush and the right-hand comb is thus laden with + electricity, which acts as exciter to the farther plate. Consequently — electricity is showered on to the farther plate, and carried over the obtuse angle to the left; and this negative layer acts as the rubber, which may now be removed. Further, a diametral conductor has a very small capacity, and + electricity cannot be showered from one end without negative electricity being at the same time discharged from the other. Consequently the lower obtuse (left) angle of the nearer plate is — charged, and the lower obtuse (right) angle of the farther plate + charged. It is seen that + electricity, therefore, is continually carried towards the left comb, and negative towards the right. The combs collect the charges, and the acute angles are therefore always more or less completely discharged. The Wimshurst is sometimes made with concentric cylinders, and hard rubber frequently takes the place of glass. Gray's *Electrical Influence Machines* (2d ed. 1903) gives a very complete account of induction machines, and Part III. is devoted to their design and construction.

Electrostatic Voltmeters. See **Electrometer**.

Electrotherapy. See **Electricity in Medicine and Surgery**.

Electrotropism, a term meaning the sensitiveness of plant organs to electric currents.

Electrotyping. See **Electrodeposition and Printing**.

Electrum is a term used by the ancients to designate both amber and an alloy of gold and silver which was found naturally in veins and also compounded artificially. It was used both for plate and for coins.

Electuary, a term used in pharmacy for drugs compounded with honey, syrup, or conserves. Electuaries are seldom used at the present day.

Elegit, Writ of, a form of execution by which a creditor obtained the chattels of the debtor and possession of one half of his lands. The writ is in use in the United States to some extent, with different modifications in the various States adopting it.

Elegy, probably originally 'a funeral song set to the flute.' Since such songs were commonly written in couplets, each composed of a hexameter and a pentameter line, any poem in which this particular meter was used came to be known as an elegy. As a literary form the elegy first made its appearance in Ionia during the 7th century B.C. The Greek poets—as Callinus of Ephesus, Mimnermus of Colophon, and Theognis of Megara—continued to employ the elegy for funeral verse, but also adapted it to martial, ethical, satirical, and erotic themes. An offshoot of the funeral elegy is the epitaph; of the more general elegy, the epigram.

The term, as employed by modern writers, remains somewhat ambiguous, but in general it is considered as applying to the poetry of regret or of mourning or a species of lyric in which the element of meditation outweighs that of emotion, as in Gray's *Elegy Written in a Country Church Yard*. Elegies in this significance form a rich division of English literature. Notable examples are: Chaucer's *The Boke of the Duchesse* (on Blanche of Lancaster); Milton's *Lycidas* (on Edward King); Shelley's *Adonais* (on Keats); Tennyson's *Ode on the Death of the Duke of Wellington*, and *In Memoriam* (on A. H. Hallam).

Elemental Spirits, or Angels of the Elements, an important factor in the religion of the Kabbalists or Gnostics, the Jews, and the Zoroastrians. According to the popular belief, air, earth, fire, and water had each its dominating spirit, under whom were hosts of subordinate angels, as the guardians of heat, wind, rain, etc.

Elements, those forms of matter which hitherto have defied all efforts to break them up into portions having different properties. With the exception of the few in the argon group, which only occur free, the elements are the components of the material universe, and are chiefly found in combination. Carbon, oxygen, nitrogen, sulphur, copper, and silver are found free in the earth's crust in considerable quantities, though, like the majority, they occur mainly in compounds. The elements are often classified as metals and non-metals; but the two classes merge imperceptibly into one another, so that for practical purposes the system is almost abandoned, and that of the periodic law of Mendeléeff substituted.

Appended is the list of elements, with the symbols and atomic weights (on the basis O = 16) approved by the International Committee on Atomic Weights

E. J. Murphy, of the physics department of the Alabama Polytechnic Institute, discovered evidence of the presence of Element 87, which was one of the missing elements. In samples of pollucite and lepidolite were found minima at points of the scale corresponding to an element of the chemical equivalent ascribed to *ekacaesium*. The splitting of uranium added plutonium and neptunium; the bombarding of these resulted in the discovery of 95 and 96.

Table of Elements

Element	Symbol	Number	Atomic Weight
Actinium	Ac	89	226.7
Alabamine	Ab	85	227.
Aluminium	Al	13	26.97
Antimony	Sb	51	121.76
Argon	A	18	39.944
Arsenic	As	33	74.91
Barium	Ba	56	137.36
Beryllium	Be	4	9.02
Bismuth	Bi	83	209.
Boron	B	5	10.82
Bromine	Br	35	79.916
Cadmium	Cd	48	112.41
Calcium	Ca	20	40.08
Carbon	C	6	12.01
Cerium	Ce	58	140.13
Cesium	Cs	55	132.91
Chlorine	Cl	17	35.457
Chromium	Cr	24	52.01
Cobalt	Co	27	58.94
Columbium	Cb	41	92.91
Copper	Cu	29	63.57
Dysprosium	Dy	66	162.46
Erbium	Er	68	167.2
Europium	Eu	63	152.
Fluorine	F	9	19.
Gadolinium	Gd	64	156.9
Gallium	Ga	31	69.72
Germanium	Ge	32	72.60
Gold	Au	79	197.2
Hafnium	Hf	72	178.6
Helium	He	2	4.003
Holmium	Ho	67	163.5
Hydrogen	H	1	1.0081
Illinium	Il	61	146.
Indium	In	49	114.76
Iodine	I	53	126.92
Iridium	Ir	77	193.1
Iron	Fe	26	55.84
Krypton	Kr	36	83.7
Lanthanum	La	57	138.92
Lead	Pb	82	207.21
Lithium	Li	3	6.94
Lutecium	Lu	71	175.

Magnesium	Mg	12	24.32
Manganese	Mn	25	54.93
Mercury	Hg	80	200.61
Molybdenum	Mo	42	95.95
Neodymium	Nd	60	144.27
Neon	Ne	10	20.183
Neptunium	Nu	94	240.
Nickel	Ni	28	58.69
Nitrogen	N	7	14.008
Osmium	Os	76	190.2
Oxygen	O	8	16.
Palladium	Pd	46	106.7
Phosphorus	P	15	30.98
Platinum	Pt	78	195.23
Plutonium	Pu	93	239.
Polonium	Po	84	210.
Potassium	K	19	39.096
Praseodymium	Pr	59	140.92
Protactinium	Pa	91	231.
Radium	Ra	88	226.05
Radon	Rn	86	222.
Rhenium	Re	75	186.31
Rhodium	Rh	45	102.91
Rubidium	Rb	37	85.48
Ruthenium	Rn	44	101.7
Samarium	Sm	62	150.43
Scandium	Sc	21	45.10
Selenium	Se	34	78.96
Silicon	Si	14	28.06
Silver	Ag	47	107.88
Sodium	Na	11	22.997
Strontium	Sr	38	87.63
Sulphur	S	16	32.06
Tantalum	Ta	73	180.88
Tellurium	Te	52	127.61
Terbium	Tb	65	159.2
Thallium	Ti	81	204.39
Thorium	Th	90	232.12
Thulium	Tm	69	169.4
Tin	Sn	50	118.70
Titanium	Ti	22	47.90
Tungsten	W	74	183.92
Uranium	U	92	238.07
Vanadium	V	23	50.95
Virginium	Vi	87	224.
Xenon	Xe	54	131.3
Ytterbium	Yb	70	173.04
Yttrium	Y	39	88.92
Zinc	Zn	30	65.38
Zirconium	Zr	40	91.22

Elemi, the name of a resinous gum derived from various plants of the Myrrh (*Bursera*) family. Elemi is soluble in alcohol and is used in the preparation of ointments and as incense in the East.

Elephant (*Elephas*), the largest terrestrial mammal, assigned to the sub-order Probosci-

dea of the order Ungulata. The elephant is from 8 to 10 ft. in height and weighs from 2 to 5 tons. Its build is massive and bulky, the head very large and the limbs strong and thick. In color it is dark gray, with a thick, tough, almost hairless skin. The most striking external peculiarity is the long flexible proboscis ending in the nostrils and used as an organ of prehension, for conveying food and drink to its mouth, as a means of defence, and for other purposes.

There are two living species of elephant—the African (*E. africanus*) and the Indian (*E. indicus*). Both elephants have relatively small brains but show great sagacity under training. In the wild state they live in herds. The diet is exclusively vegetarian; apparently that of the Indian elephant is usually of a more succulent nature than that of the African form—the latter eating roots, tubers, bulbs, and branches, and the former chiefly grass and fresh shoots of trees.

Elephants are very largely used in India for draught and pack purposes, such as dragging the heavy guns used in sieges, carrying light mountain guns on their backs in rough, hilly country, transporting heavy baggage, and carrying persons. An elephant will carry from 1,700 to 2,200 lbs. on long journeys, maintaining a steady pace of about four miles per hour. For extinct forms, see articles MAMMOTH and MASTODON.

Consult Sanderson's *Wild Beasts of India*; Herbert's *The Elephant* (1916); Kunz' *Ivory and the Elephant in Art, Archaeology and Science* (1916); Lyell's *The African Elephant and Its Hunters* (1924).

Elephanta (native name *Gharapuri*), a small island in the harbor of Bombay, 6 m. e. of the city, so named from a huge stone elephant which once stood near the old landing place at its southern extremity. The island is famous for its Brahmin cave-temples hewn from the rocks and covered with sculptures depicting Hindu mythology.

Elephant Butte Dam, the chief feature of the Rio Grande Project, one of the irrigation undertakings of the U. S. Reclamation Service, located on the Rio Grande River just below Elephant Butte, N. M., which is in the extreme southeast corner of the State. The dam was completed in 1916 at a cost of more than \$5,000,000. The dam brings under cultivation 180,000 acres of land, 155,000 of which are in Southern New Mexico and Texas.

Elephantiasis, or **Barbados Leg**, a disease characterized by inflammation and obstruction of the lymphatics producing hypertrophy of

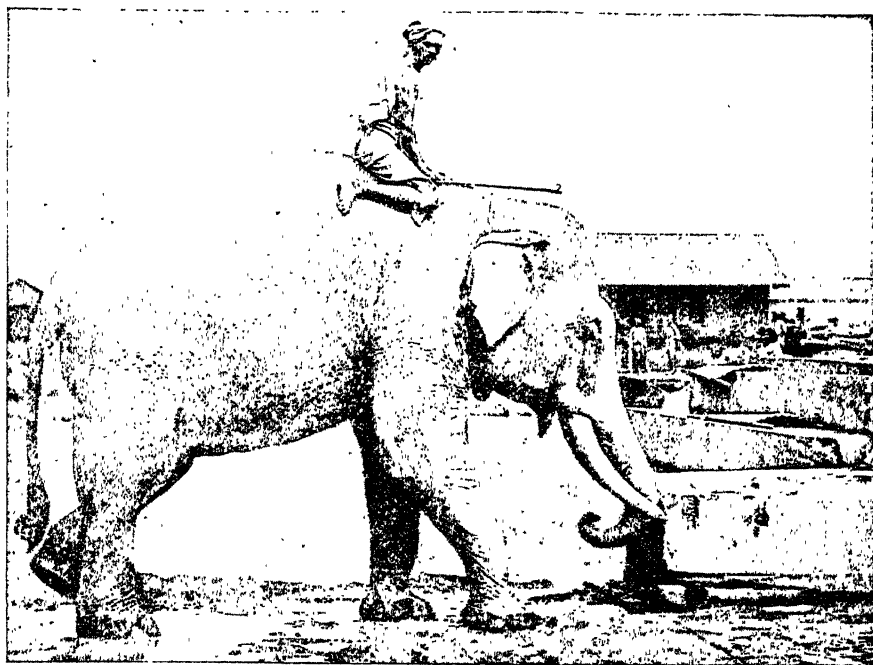
the skin and subcutaneous tissues, chiefly in the legs (95 per cent. of cases) and genitals. It is due in the majority of cases to infestation with the embryos of *Filaria sanguinis hominis* which block the lymph channels.

Elephantine, an island in the Nile, with a town of the same name. In the southern part of the island are the ruins of the ancient town of Elephantine. One of the most interesting objects on the island is the Nilometer, restored to use in 1870 after a thousand years of neglect. Its walls are covered with Greek inscriptions giving the water levels.

Tortoise Plant (*Testudinaria elephantipes*), a South African twining plant belonging to the Dioscoreaceæ. Its rootstalk somewhat resembles a turnip in color and texture and is baked and eaten by the natives.

Elephant Shrew, or **Jumping Shrew** (*Macroscelides*), a small, long-nosed, shrew-like mammal, of which several species are found in Africa. They are ground animals, nocturnal in habit, and move by long leaps.

Eleusine, a genus of coarse annual grasses known as 'crab-grass' or 'jara grass.' They are all natives of the warmer parts of the world,



Asiatic Elephant working in a Burmese Timber Yard.

Elephant Seal, the largest of the true seals (*Phocidæ*). The male, which may measure as much as 20 or 22 ft. in length and 12 ft. in girth, has a peculiar proboscis, about a foot long, having the nostrils at its extremity. The short, coarse fur, usually gray in color, is valueless; but the body yields a large amount of excellent oil.

Elephant's Ear, a popular name for a species of *Colocasia*, known as *Caladium esculentum*. It is native to Hawaii and the Fiji Islands; in the former place the root-stock is used for food and to make the famous poi.

Elephant's Foot, **Hottentot Bread**, or

some of them being of value as cereals. The chief species are *E. indica*, or goose grass, a common American weed.

Eleusinian Mysteries, ancient rites celebrated annually in honor of Demeter and her daughter Persephone. After a preliminary festival at Agræ in March the greater festival was observed at Eleusis, in September. The initiates of the mysteries were sworn to secrecy and so well did they keep their vows that complete information has never been obtained concerning them. That they exerted a remarkable influence and had a tremendous personal appeal is shown by the fact that

they were continued until the 4th century of the Christian era.

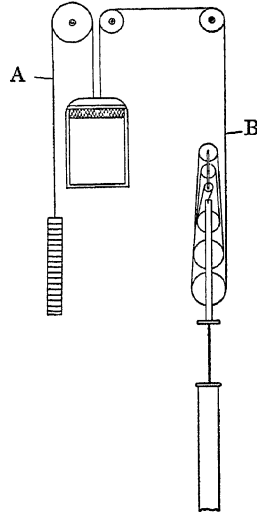
Eleusis, town, Attica, in ancient Greece. It had a famous temple of Demeter, and was the scene of the annual Eleusinian Mysteries. Remains of its famous buildings have been discovered in excavations made by the Greek Archaeological Society since 1882.

Elevation, in astronomy, the height in the sky of a heavenly body measured by the arc of a vertical circle intercepted between it and the horizon. It is complementary to zenith-distance. The elevation of the pole is equal to the latitude of any given spot on the earth.

Elevator, a mechanical device for raising persons or objects to a higher level. It consists of a rectangular car which moves up and down between guides in a well or shaft, which has doors opening into each floor, and the necessary mechanism and devices for control and safety, to permit of its movement up and down. In the United States the increasing height of buildings has undoubtedly led to a like increase in use of elevators. The modern elevator is a direct evolution from the machine which Elisha G. Otis exhibited in 1853 at the World's Fair in the Crystal Palace, New York. In 1871 the hydraulic elevator was introduced, and thereafter was developed side by side with the steam machine. Finally in 1889 the first commercially successful electric elevator was installed. There are, therefore, four general classes of elevators in use—hydraulic, electric, steam, and belt driven. The great varieties of conditions encountered in elevator installation and operation have resulted in the development of a number of modifications of each of the four general types.

Hydraulic elevators may be classed as cylinder machines, which may be subdivided into vertical and horizontal, and direct plunger. The vertical cylinder machines are perhaps the most common. In this type the cylinder of suitable diameter is placed in a vertical position in or near the elevator shaft. A piston attached to a piston rod works within the cylinder or the piston consists of a solid plunger which projects from the cylinder. The outer end of this piston rod or plunger carries a series of sheaves over which the hoisting cables pass. (See Fig. 1.) The same arrangement is used with the horizontal machine except that the cylinder is located in the basement at some point near the elevator hoistway. The hoisting rope is run over the fixed and movable sheaves until the desired multiplication of travel is obtained. This ordinarily varies from four-to-one to twelve-to-one. The water to the cylin-

der is supplied through a 3-way valve or in some cases by two separate valves, one of which will admit water under pressure to the cylinder and the other will permit the water in the cylinder to be discharged to an open tank or, in certain cases, to the part of the cylinder above the piston. A pressure regulator is furnished which will shut off or bypass the



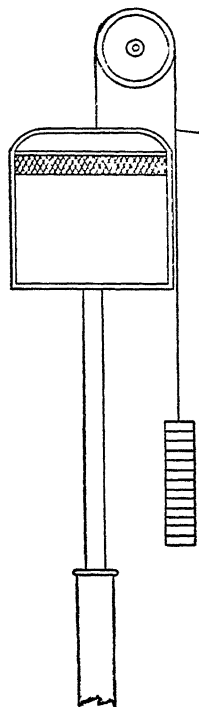
Elevator. Fig. 1. Horizontal Cylinder Hydraulic. A, Car counterweight rope. B, Main hoisting rope.

pump in case safe working pressure is exceeded. Hydraulic cars are generally counter-balanced for part of the weight of the car, leaving enough unbalance to permit the empty car to descend at the desired speed. An automatic shut-off valve is provided to stop the car at the terminal landings.

The plunger elevator consists of a casing or cylinder sunk in the ground in the center of the hoistway. This casing is slightly longer than the full travel of the car. (See Fig. 2.) The plunger, which is generally of steel tubing, is attached directly to the lower part of the car and enters the cylinder through a stuffing box. Water is admitted through an annular opening around the top of the piston, the pressure lifting the car. When the discharge valve is opened the water is permitted to flow from the casing, the car descending by gravity. Counterweighting is provided for all cars of very short travel and is somewhat less than

the weight of the empty car. The automatic terminal stops are of the same general type as that employed by other types of hydraulics.

The plunger elevator has certain inherent safety features, the most important of which is the fact that the car being supported directly on the piston cannot drop as might be the case with a car suspended from cables. The



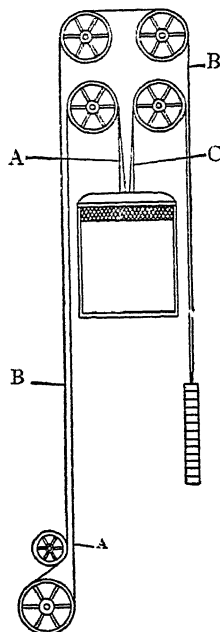
Elevator. Fig. 2. Direct Plunger Hydraulic. A, Car counterweight rope.

objections to this type of elevator are, in addition to the rather low mechanical efficiency, that it is almost impossible to drill the hole for the casing so that it is absolutely vertical. Aside from their use on sidewalk lifts, where they are still employed to a limited extent, generally being worked directly with water from the city main, this type is not being installed at the present time except in very rare instances.

Electric Elevators. The electric elevator was commercially introduced about forty years ago, but owing to the lack of suitable control apparatus was not particularly successful in competition with the hydraulic machine. Im-

provements in the control, however, eliminated the earlier objections and its use developed rapidly.

The *drum type* of electric elevator (see Fig. 3) which was first developed and is still extensively used may be described as follows. The motor is connected to a suitable drum provided with spiral grooves by means of a worm shaft engaging with one or two worm wheels; the latter being connected to the winding drum. Where one gear is used the end thrust on the gearing must be taken by thrust bearings. With the double or tandem gears, right and left hand worms are provided and the gears which mesh with these worms also



Elevator. Fig. 3. Base-mat Back Drum Counterweight Type. A, Main hoisting rope. B, Drum counterweight rope. C, Car counterweight rope.

mesh with each other. With this combination the gears take the thrust. On the shaft connecting the armature to the worm is generally mounted the brake drum on which a leather or fabric-lined brake band or shoe operates. The brake shoe or band is normally held against the wheel by a heavy spring or springs, thus holding the gearing and cable drum im-

movable. A solenoid is provided to compress the spring and relieve the tension on the brake shoes. When the controller admits current to the armature of the motor, current is also supplied to the solenoid, which is mounted either above or alongside of the brake, releasing the brake band so that the motor is free to drive the worm gear. On shutting off the current from the motor, the solenoid becomes de-energized and allows the spring to apply the brake.

Practically all electric passenger and most freight machines are equipped with a solenoid release brake which is spring applied. However, this friction brake would not be sufficient to stop the elevator from high speeds if it alone were to be depended upon. The controller of practically all d.c. high speed machines is so arranged that when the car switch is centered or when the floor selector mechanism cuts off the driving current, the motor itself is used as a dynamic brake, the generated current flowing back into the line. The dynamic braking effect varies as the *square* of the speed so that at high speed a very powerful braking effect is secured. The friction brake having an approximately straight-line speed braking effect becomes a predominant factor when the speed has dropped to a certain percentage of full running speed and at the very lowest speed is practically the sole braking agency. The friction brake also serves to hold the car and load when the car is standing at a landing.

Alternating Current Machines. In the early days of electric elevators practically all such equipment was installed in the congested portions of the larger cities and the current available was in almost every case direct current. The tendency in power generation in more recent years has been to supply the outlying sections of metropolitan areas with alternating current. An ever growing demand has arisen for alternating current machines for buildings located in the districts supplied with alternating current. Owing to the difficulty of securing high starting torque and good speed control regulation, the alternating current machines first developed were not particularly successful. However, the growth of the demand for equipment of this kind has been the cause of extensive development of alternating current equipment so that today it compares very favorably with direct current in performance where a high grade of hoisting and control equipment is employed. The alternating current machine now used for moderately high speed work is, as a rule, a double wound induction motor. Generally, high speed windings have either $1/3$

or $1/4$ the number of poles of the slow speed winding. By the use of the two-speed winding a considerable amount of regenerated braking may be secured, the motor acting as the induction generator. With alternating current machines of the single speed type, it is necessary to provide much larger and more powerful brakes than would be the case with direct current machines of the same speed and capacity because on a motor of this type regenerative braking cannot be secured. Many of the early alternating current brakes were objectionable from the standpoint of the noise of operation. Elevator builders have, however, succeeded in overcoming this and the alternating equipment compares favorably in quietness as well as efficiency with direct current.

Controllers.—Fundamentally, modern elevator controllers consist of a board provided with a series of magnetically operated switches for starting and stopping the car in either direction of travel, for automatically accelerating the load, and for providing the necessary circuit to bring the car to rest gradually. Usually, the controller is provided with a potential switch which is normally held engaged so long as the switch on the incoming circuit is closed. This potential switch is opened only in case of some abnormal condition arising through the operation of the elevator. The magnet which holds this switch in place is supplied with current through a circuit which ordinarily runs through the upper and lower and final limit switches, the safety switch on the car, and a switch on the governor or safety. In addition to this, other auxiliary safety switches may be placed in series in the same circuit so that the opening of any one of them will shut off current from the entire controller. This potential switch also acts as no-voltage switch and may be equipped to drop out on over-voltage or over-load. This potential switch usually opens both sides of the incoming line. After passing through the potential switch the current feeds in parallel to two direction switches which are mechanically interlocked by various ingenious mechanisms so that it is impossible for both the up and down direction switch to be in operation at the same time.

In the usual type of *resistance control*, which until a few years ago was almost the universal type and is still very largely used, the current fed to the armature is limited by a series of resistances, generally cast iron grids, mounted on the rear of the control board. Various sections of these resistances are cut out of circuit

by a series of automatic switches known as acceleration switches.

In order to secure the high starting torque necessary to produce rapid acceleration many controllers are arranged so that a heavy series field is provided during the starting and accelerating period. This series field is usually short circuited when the last accelerating switch contact goes in. In order to obtain a reasonably constant speed up and down with any load that may be placed in the car, field regulation is frequently resorted to.

The chief objection to resistance control is the fact that a considerable amount of power is wasted as heat in the starting resistance. An effort to produce higher operating efficiency led to the introduction of the *multi-voltage machine*. A motor generator set is provided which supplies current to all the elevator machines in the group, there being available several voltage steps, as for example 60, 120, 180, and 240. By applying these various voltages successively to accelerate the motor much of the power lost in resistance control was saved. However, the motor-generator set itself had certain losses and these become appreciable where the generator is run over a considerable period of time where the cars were idle or operated only occasionally.

A still more modern system of control is that known as the *variable voltage*, or *unit multi-voltage*. In this system each elevator motor is provided with a separate motor-generator set. The output to the generator is fed to the elevator motor. The entire control of the elevator is secured by increasing, decreasing, and reversing the field of the generator.

In order to take care of installations where the employment of an operator is not justified, as for example in private residences, a form of control has been developed known as the *push-button* or *automatic control*. A series of push-buttons in the hallways and a set of similar buttons, one for each floor, on the car are used to control its motion. The operation of a hall button calls the car to that landing. After the passenger enters the car, closes the door and pushes a button for the floor to which he wishes to travel the car starts, runs to that floor and stops automatically. The early pushbutton elevators were not regarded as being particularly safe but the development of additional safety equipment has brought about their widespread use.

In order to widen the use of this type of equipment several manufacturers have developed a system known as collective pushbutton control in which the hall buttons are arranged

to stop a car going in the direction in which the person pressing the button wishes to travel. When the car arrives at the landing the passenger may enter and the closing of the car gate will automatically start the car again towards its original destination. This form of control has multiplied the service which may be given by pushbutton elevators. It is particularly valuable for use in apartment houses, hospitals, and similar institutions.

Car Construction.—The majority of all passenger and freight elevators are provided with a rectangular frame of steel known as a sling. The cables are attached to the upper member, known as the crosshead, and on this frame or sling are mounted two pairs of guide shoes, one pair above and one pair below the frame. These run on the guide rails and serve to keep the car in its correct position in the hoistway. A safety device for stopping the car in case of failure of hoisting cables or overspeed is attached to this sling generally on the under side but occasionally fastened to the crosshead. The car platform normally rests across the bottom member of the sling and in most cases is supported by inclined rods or braces attached to the platform and to the crosshead near the top. On certain large elevators two slings are provided running on two sets of guide rails. In this case the safety device is provided with four sets of jaws, two beneath each sling, all being geared together by suitable shafting and gears.

Guide rails for elevators may be either of wood or metal. Wood rails are generally of rectangular sections and the material employed is ordinarily maple or dense yellow pine. Wood rails are all limited to comparatively light loads, low speeds, and short rises. The objections to them are the tendency to warp or twist out of line and the lack of homogeneity. Steel rails are by far the more common. They consist of T-shaped sections and ordinarily are machined on the faces and top of the head, this being the portion used for guiding the car. The rails are either tongued and grooved or doweled and the joints are secured by fish plates. It is necessary to secure very exact alignment of rails if satisfactory operation is to be secured.

In order to provide a means of stopping and holding the car should the hoisting cables fail and to provide a means of bringing the car to rest in case of overspeed, elevators are equipped with *safeties*. The type of safety most generally employed consists of a pair of rail clamps placed under the car. These clamps are pinned together and are provided with

arms projecting in back of the pin. By driving a wedge between these projecting arms the faces of the grips are made to clamp on the guide rails. The mechanism for applying the pressure to these jaws usually consists of a drum upon which a number of turns of cable are wound. This drum is mounted on a shaft provided with left and right hand threads the ends of these shafts being fitted to the wedge blocks or cams. When the cable is unwound from this drum the shaft is rotated and the wedge of cams pushed (or in some cases pulled) between the extensions of the gripping jaws causing them to apply. The safety is ordinarily operated by a governor of the fly-ball of centrifugal type which trips at a predetermined overspeed, generally about 40 per cent., above the rated car speed. This governor is driven by an endless cable attached to a bracket on the car through a spring shackle. Tension is provided in this governor rope by a counterweighted sheave at the bottom of the hoistway. When the governor locks it grips the down running governor rope and holds it immovable. As the car continues to fall the governor rope shackle is pulled loose from its spring-holder on the car and with it the safety drum rope which is fastened to the governor rope through the shackle. As the car continues to fall the rope is unwound from the under-car drum thus applying the safety. One of the new types of safety uses a corrugated roller but in place of engaging with a rigidly fastened inclined plate presses against a plate which is held in place by a powerful spring. When the roller engages this spring it allows the plate to yield somewhat and a gradual stop is secured. This type of safety has three advantages over the usual type of wedge clamp safety: first, it does not depend on the pulling of the governor rope for its action, being self-locking after the roller engages; second, it will go into action much more quickly than the wedge clamp safety (for with the latter safety it is necessary for the car to fall a considerable distance, generally from three to four ft., after the governor locks before the safety jaws are locked; this is of particular importance where the hoisting ropes have broken and the car is falling freely); third, the flexible guide clamp safety will not give an unduly high retardation to the car if a bad rail joint is encountered during the stop.

With the earlier types of elevators blocks of hard wood were placed under the car to lessen the impact should the car run into the pit. As car speeds increased heavy coiled springs replaced the 'bumper' blocks. They

were reasonably satisfactory for slow or moderate speeds but with still higher speeds the rebound of the car upon striking such a spring became serious. This led to the development of the hydraulic buffer which consists of a fixed cylinder and a plunger which engages the descending car and is forced down by it. The motion of the plunger is retarded by oil which is forced to flow through a series of holes or slots—the area of such openings decreasing as the plunger travels downward. Generally, these openings are designed to give approximately constant retardation to the car for one designed speed and load. A spring powerful enough to return the buffer to its original position is provided. The top of the buffer also carries a spring which is compressed while the plunger is being brought up to the speed of the car. Similar buffers are generally provided on the counterweight of traction machines; in this case, however, the return spring is omitted and the plunger returned to its original position by gravity.

In order to provide a final method of stopping the car in case of emergency most elevator codes now require, and practically all elevator builders install, a set of switches wired independently of the normal slow-down and arrange to stop the car when it has travelled a certain predetermined distance beyond either terminal landing.

The cables ordinarily employed for elevator service are composed of six or more strands each of which in turn is made up of a number of separate wires. The strands are twisted about a hemp center which serves as a cushion and also as a reservoir for lubricant. Perhaps the most commonly used construction is known as 6-19, that is six strands of 19 wires each. A mild steel rope is very generally employed for the traction machines.

The rope used on the safety drum underneath the car may be of steel, bronze, or monel metal. Because this rope is ordinarily not as subject to tension except during the operation of the safety and because this rope may not be called upon to function for a period of years it may deteriorate through rusting without its condition becoming known. It is of the utmost importance that when called upon it shall have the requisite strength to operate the mechanism and stop the car. The use of bronze rope and monel metal for this purpose is a comparatively recent development and one that will insure all the needed strength even after a long period of non-use and neglect.

As the cables in themselves represent in high rise elevators installations of considerable por

tion of the total suspended weight it is evident that the speed of the elevator would vary with the amount of cable hanging from one side of the sheave or the other during a run unless this were compensated in some manner. As the weight of the cable on high rise installations may amount to as much as two tons the effect of the unbalance on the performance of the machine would be quite serious if means were not taken to compensate for it. The present practice is to provide on all elevators over 75 or 100 ft. travel compensating ropes which are attached to the bottom of the car and the bottom of the counterweight. On moderate rises this may be of the same diameter and material as the hoisting ropes. On very high rises they are generally designed to equal the weight of the hoisting rope plus the suspended portion of the travelling (control) cables.

Openings to the elevator hoistway are practically always provided with doors of some kind, the most common being horizontal sliding doors. These may be made in one, two, or even more sections. The modern tendency is to use doors made up of two, three, or four sections, so geared together that the section or sections, which close the opening at the jamb or at the center move at a greater speed than the outer sections.

As more than one-half of the time consumed in a round trip in the average elevator is spent at the landing the time necessary to open and close doors becomes a very important factor in the speed of service. The modern tendency is to employ relatively light doors mounted on hangers with ball or roller bearings so that the minimum effort is required to open and close them. In the most modern high speed installations the time of door operation is still further shortened by the use of semi- or full-automatic door closing devices.

Doors for freight elevators fall into two general classes: first, solid and substantial doors, generally metal clad, which are frequently located just inside of the hoistway line and, second, light open work or lattice doors or more properly gates which may be placed either just inside of the hoistway or in the doorway itself. Frequently where large fire doors are provided on the landing side of the hoistway opening these hoistway gates are installed at the inner or shaft side.

The interlock is a mechanical or electro-mechanical device which will hold locked the hoistway door except when the car is at the landing and will prevent the operation of the elevator unless the hoistway doors are closed and locked. The use of interlocks is com-

pulsory in several States and many cities and is doing much to eliminate the most common cause of elevator accidents—that of persons being caught and crushed by the car while entering or leaving the elevator.

Electric *contacts* are devices which will prevent the operation of the car when the hoistway door or car gate is open. They are used largely on the car gate and are also used to a considerable extent on freight elevator doors.

As it is possible that the elevator may be stopped between floors owing to the interruption of the power supply or because of accident to the controller or machine or through the setting of the safeties an emergency exit is generally provided in the top of passenger cars. This exit may be a wire grille or sheet metal panel and is of ample size to permit the passengers to leave the car.

Freight elevators are in general similar to passenger cars except that frequently the control is more simple and does not give as smooth an acceleration as would be the case in passenger machines of similar speed.

The machines may be direct connected or belted. Where cost is of prime consideration or where electric current is not available as may be the case in an isolated community, belt driven elevators are employed. There are two kinds of belt driven elevators in common use at the present time—double-belt and single-belt machines. The chief difference between these two types is that the double-belted machine runs a shaft which rotates continuously in one direction while the single-belted machine is driven from a separate prime mover which may be reversed from the car.

Steam Elevators. Occasionally steam engines are employed to operate elevators, the engine being connected to a drum by suitable gearing. At present they are confined primarily to use on ship-board where they frequently are arranged to stop automatically at the deck level.

Hand Elevators. Many small freight and passenger elevators are operated by hand power. The usual arrangement consists of a drum or drums placed overhead upon which the hoisting cables wind, the drum being driven by gearing from a large wheel or sheave over which is run an endless rope extending to the bottom of the hoistway. By pulling on one run of this rope the car may be made to ascend and by pulling on the other run of the rope the car may be made to descend. A hand-applied and released brake is generally furnished which is operated by one or more smaller ropes. Such hand power elevators are rather common in private homes where it is

necessary to transport invalids or very aged persons from one floor to another, and are known as invalid lifts.

Dumb Waiters. A dumb waiter is a small elevator designed to transport goods only. It is limited by most codes to a platform area of 9 ft., an overall height of 4 ft., and a maximum capacity of 500 lbs. Some dumb waiters are made for pushbutton operation with full magnetic control and will run at speeds comparable with passenger elevators. Such equipment is rather common in hotels, apartment houses, and restaurants.

Escalators. An escalator is a power-driven stairway arranged to transport passengers either up or down. It consists essentially of a series of gratings or steps which travel upward at an angle somewhat less than that employed for the usual type of fixed stairs. A hand railing which moves at the same speed as the step or tread is generally provided. Ordinarily, the speed of these moving stairways or escalators is low, approximately 100 ft. per minute, but they are capable of handling an exceedingly large number of passengers in a given time as it is not necessary to stop the mechanism to take on or discharge passengers, the passenger simply stepping on the tread at the bottom if the escalator is ascending and stepping off at the top. Its use is confined generally to the larger cities.

Mine Elevators. Mine elevators are generally drum winding machines although there are some installations in which traction machines are employed. As a rule the speeds are higher than are employed in ordinary passenger or freight work and because of the great depths to which such hoists operate the factors of safety on cables are generally considerably lower. In most cases a single hoisting rope is used. In the case of extremely deep mines such as certain of the mines in the copper district in Northern Michigan depths are so great that tapered cables are employed, the end of the cable attached to the cage being much smaller than the end fastened to the drum. By the use of constructions of this kind the total weight of the cable is kept down, and as ordinarily designed the factor of safety taken at the point at which the cable winds on the drum is uniform irrespective of the position of the car; that is to say that the cross section of the cable for any position of the car is such that it will have the same factor of safety when the weight of the car and the suspended section of the cable are taken into account. Such mine hoists are of course not counterweighted,

the machine being powerful enough to lift the entire weight of the car and load.

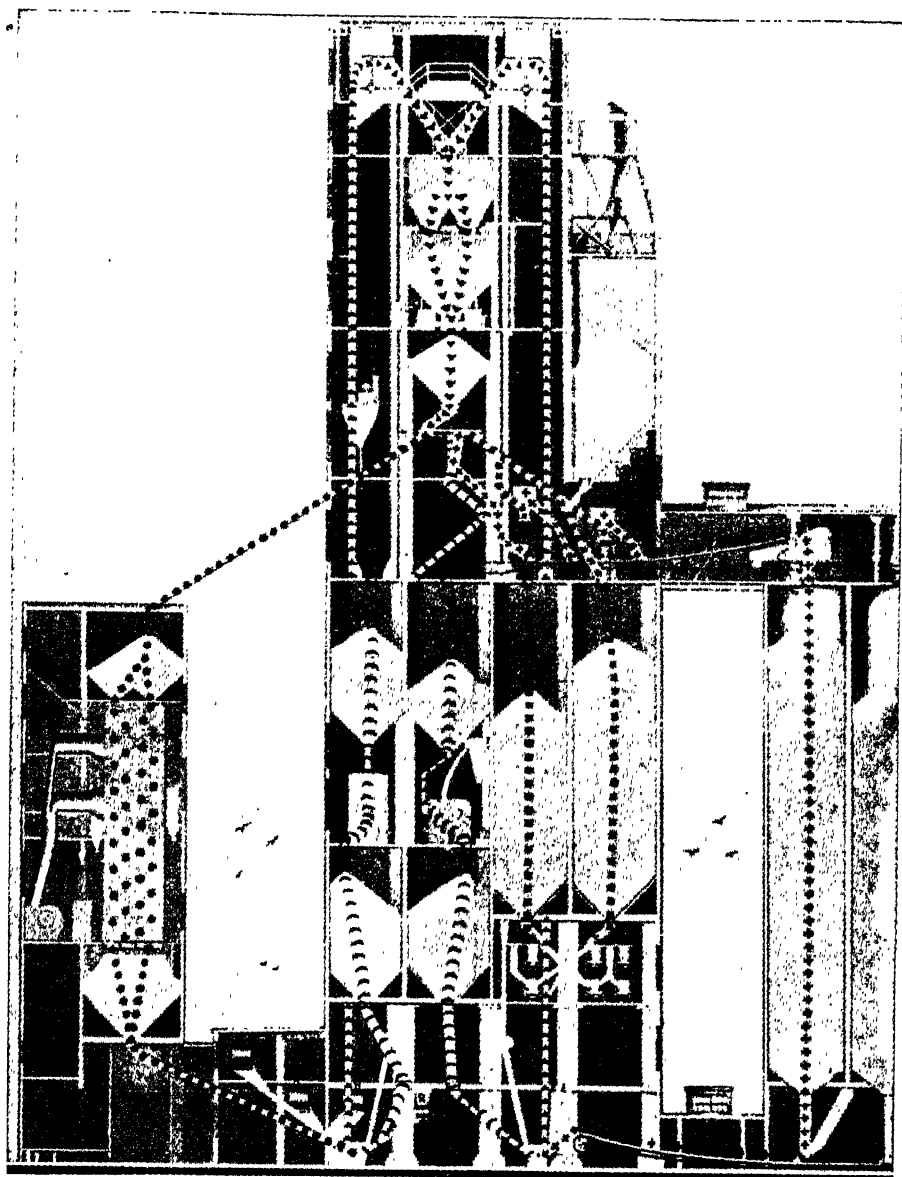
Elevator Codes. A large number of cities and States have prepared regulations covering the manufacture, installation, and use of elevators. There is, however, a wide variation in the requirements of the different codes. A national code has been prepared by the American Society of Mechanical Engineers, American Institute of Architects, and Bureau of Standards under the procedure of the American Engineering Standards Committee and is probably the best reference standard for such equipment. It is revised from time to time and the latest edition may be obtained from the American Society of Mechanical Engineers.

Elevators, Belt and Bucket. See **Conveying and Elevating Machinery.**

Elevators, Grain, special forms of machinery for moving and storing grain and similar commodities. The constantly increasing demand for grain, flour and cereals for export has caused a large increase in production throughout the grain producing sections, necessitating increased facilities at inland and seaport terminals for the receiving, storing and shipping of grain, and in consequence elevators of large capacity have been built to insure efficient and rapid handling.

Adjacent to the elevator, tracks have been reserved exclusively for its use to accommodate 1,232 cars. On the tracks leading to the elevator 135 loaded cars can be placed for inspection and moved to the elevator by car hauls for unloading. These approach tracks are covered, and during wet weather cars are allowed to dry before being placed over the unloading pit. This prevents the water and dampness from getting into the grain as it is being unloaded. After the cars have been unloaded they are moved by gravity to the storage tracks for the use of empty grain cars.

Grain being delivered to the plant is received over four tracks, three of which lead to the main car dumpers. Each dumper and the equipment for placing cars thereon is designed to handle and unload a car about every $7\frac{1}{2}$ minutes, making it possible to unload 16 cars per hour by means of the 2 dumpers which are installed. In connection with each dumper there is an auxiliary receiving pit over which the cars are placed after being removed from the main dumper. The grain left in the cars after leaving the dumpers and also the grain doors are removed over these auxiliary pits while the following car is being dumped. This



PHANTOM VIEW OF TYPICAL GRAIN ELEVATOR

- ▶ Grain elevators, main line of travel to scales and distributing turn head.
- Grain line to garner house to be dried and cooled.
- From turn head to conveyor belts and shipping bins.

- ✚ From turn head to storage bins and elevators.
-) From turn head to upper and lower cleaning bins and elevators.
- S From shipping bins to shipping belts.
- R Receiving belts.

arrangement makes it possible to work on two cars simultaneously and will not delay the operation of the main dumpers which would be the case if the cleaning of all the grain from the cars and the removing of the grain doors were done on the main dumpers.

Grain from the auxiliary pits is transferred to the main receiving belts by means of a 36" belt conveyor, and delivered to the workhouse the same as if received on the main car dumpers. Two additional auxiliary pits, known as the shovel pits, are provided on the fourth track. These pits are also equipped with automatic shovels and are for unloading bulkhead cars, bad order cars or odd lots of grain placed on this track. One of these pits will discharge grain onto a 36" auxiliary belt leading to an auxiliary elevator leg in the workhouse. This pit can be operated simultaneously with all the main dumpers. The other shovel pit can be used when one of the main dumpers is not in operation as the grain from this pit is deposited on one of the main receiving belts. There are three 48" receiving conveyor belts, each of which will carry 25,000 bushels per hour, and one 36" auxiliary receiving belt to carry 15,000 bushels per hour. All of these belts are operated 800 ft. per minute. Each of the three 48" receiving conveyor belts conveys the grain from the car unloaders to the receiving elevator legs, which have a capacity of 25,000 bushels per hour.

At the elevator heads there are eleven 2,500 bushel hopper scales. Over each hopper there is a 3,000 bushel garner. The capacity of the scales make it possible to weigh a full car load of grain in one operation. Under each scale is a large hopper which acts as a funnel and will cause a steady flow of grain in the spout or belt below as the case may be. Three of the hopper scales are used principally for receiving the grain from cars, but can also be used for transferring and other auxiliary purposes. The remaining scales are used for grain shipping and also auxiliary purposes. Located in the basement under the circular storage bins are six 36" belt conveyors which receive grain from the bins and deliver it to the boots of six shipping elevator legs. Each of these basement belts, and each of the shipping legs have a capacity of 15,000 bushels per hour. After the grain passes through the shipping scales it may be spouted to the shipping bins in the workhouse or to any other bin in the workhouse for any other purpose or to the driers or cleaning machines. There are 28 shipping bins under which there are six 36" shipping belts (see illustration). Grain is delivered from

all shipping bins to any of the six shipping belts which convey it to the shipping gallery over the shipping pier. There are two trippers on each belt which makes it possible to operate twelve dock spouts at the same time. When only one tripper on each belt is operating, each belt will deliver 15,000 bushels an hour to one dock spout. When two trippers on each belt are operating, each belt will deliver 7,500 bushels per hour to each of two dock spouts. The total capacity of all the shipping belts in the gallery is 90,000 bushels per hour.

The design of the trippers is such that grain can be spouted to either side of the pier from the belt. Grain can leave the shipping bins by any route and can be delivered to any hatch in any vessel alongside the pier. Between the trippers and each dock spout is a hopper with a capacity of 1,400 bushels. After the trimming and bagging is started in a certain hatch, the grain can be drawn from the hopper and the belt which was used on that dock spout can fill the hopper above and then be put on some other work while the operation of bagging is going on. If any surplus grain has been carried to the shipping pier, each dock spout is so arranged that it can deliver grain to a return belt which conveys the surplus back to the workhouse where it will be delivered to one of the auxiliary legs, weighed and returned to any bin in the workhouse or storage.

The shipping pier is provided with a marine leg, for receiving grain which has been shipped to the elevator by water. This marine leg consists of a bucket elevator, enclosed in a steel casing or frame, the whole being suspended from the crosshead of the marine leg boom which is so adjusted that it allows the leg to follow the level of the grain in the barge or steamer. The boot of the marine leg is open at the bottom allowing free flow of grain into the buckets from all sides. Power shovels are used to bring the grain from the corners of the hold which the elevator leg does not reach. When not in use, the boom is raised bringing the marine leg within the elevator. Grain from the marine leg will be carried to the workhouse by means of the same belt which is used for the surplus described above. There are also included in the equipment Hess grain driers, capable of drying 30,000 bushels of damp grain in a ten hour period and bringing it to a merchantable condition. Grain is spouted direct from any of nine scale hoppers to the drying buildings. After the grain has been dried and cooled it is spouted direct to either of the two auxiliary elevator legs, thence to the scales and

from the scales to any bin in the workhouse or storage.

In the grain cleaning and conditioning equipment there are three warehouse separators, two machines for removing smut from wheat, which are also used as oat clippers, two machines for separating oats and straw from wheat and one machine for separating cockle and small seeds from wheat. All these cleaning and separating machines are located between bins so that grain can be conditioned without operating any of the other equipment in the plant. It is spouted from the bins above into the machines and after passing through the machines it is spouted to the bins underneath from where it is elevated, weighed and put in the shipping bins or in storage as conditions call for. All the bins in the workhouse as well as in the storage are equipped with a temperature registering system, so that the temperature of the grain can be read at one central point at each ten feet in the depth of the bin. A complete laboratory for the use of Federal and Commercial Exchange Inspectors is provided.

Elf, in the legendary lore of Northern Europe, a race of human beings much finer than other kinds of men. But the commonest idea with regard to all elves considers them a race of dwarfs. According to Northern lore, the elves lived in caves and in 'elfhouses,' which were under-ground structures or chambered mounds, but had a special territory of their own called *Alf-heim*. They were understood to possess magical power, which they sometimes used beneficently, although often with malignant purpose, their general disposition being mischievous and tricky. Their special weapon was the flint-headed arrow. The prevailing idea as to their physical appearance presents them as ugly and misshapen, and their long matted hair gave rise to the term 'elflocks.' They stole children, and left their own half-idiot offspring ('thick-heads') in their place. The Lapps of mediæval Scandinavia were regarded as one and the same with the elves; and likewise the pygmies of equatorial Africa present many striking analogies with the elves of legend, and suggest that it was some race like this which inspired most of the stories of Teuton and Celt regarding a dwarfish people of quasi-supernatural attributes. See also PUCK and DWARFS.

Elgar, Edward William, Sir (1857-1934), English composer was born in Broadheath, near Worcester. His more important works include *The Black Knight* (1892); *Lux Christi*, produced at the Worcester Festival (1896);

Pomp and Circumstance (1901). In March, 1904, he received the unique honor of an 'Elgar Festival,' held at Covent Garden, at which his *In the South* (Alassio) was performed for the first time, and met with much favor. He was knighted in June, 1904, and received the Order of Merit in 1911. In 1906 he visited the United States and conducted his *Apostles* at the Cincinnati May Festival. In 1911 he was made Master of the King's Musick.

Elgin, town, Scotland. The ruins of the once magnificent cathedral, the 'Lantern of the North,' founded in 1224, are situated at the east end of the town. The 'Wolf of Badenoch' destroyed it by fire in 1390. It was rebuilt, but in 1711 the fall of the central tower almost demolished the fine structure. There are traces remaining of a monastery of the Grey Friars, the church of which was restored by the Marquis of Bute, as well as fragments of a bishop's castle and of a royal castle; p. 9,376.

Elgin, city, Illinois. The Elgin Watch Company, with 3,500 employees, is situated here; p. 38,333.

Elgin and Kincardine, Earls of. The British earldom of Elgin was created in 1633 and in 1747 was united with the earldom of Kincardine, created in 1647. THOMAS BRUCE (1766-1841), 7th Earl of Elgin and 11th of Kincardine, distinguished himself as a soldier and diplomat. When ambassador-extraordinary in Turkey, he procured the Elgin Marbles, which were sold to England (1816). His son JAMES BRUCE, 8th Earl of Elgin and 12th of Kincardine (1811-63), made arrangements with Japan for the opening of its ports to British ships. VICTOR ALEXANDER BRUCE, the 9th Earl (1849-1917) was appointed chairman of the royal commission on the Scottish Churches case, and in August 1905, chairman of the executive commission for carrying out the provisions of the Churches (Scotland) Act. He was secretary of state for colonies from 1905 to 1908.

Elgin Marbles, name given to portions of the frieze, pediments, and metopes of the Parthenon of Athens, brought by the 7th Earl of Elgin from Greece in 1815, and sold to the British Museum for £35,000 in 1816.

Elginshire, or Morayshire, a maritime county in the north of Scotland. Besides Sueno's Stone at Forres, other antiquities are Kinloss Abbey (1150), Pluscarden Priory (1230), and the castles of Lochindorb, Spynie, and Duffus; p. 41,561.

Elgon, or **Ligonyi** (*Masawa*), an extinct volcanic cone, 14,090 ft. high, in Uganda,

East Central Africa. It is described by Sir Harry Johnston as 'perhaps the biggest extinct volcano in the world.'

Eli, high priest of the Israelites at Shiloh, and the first who combined that office with that of judge, was of the house of Ithamar, the fourth son of Aaron.

Elia. See **Lamb, Charles.**

Elias, Ney (1844-97), English explorer and diplomat, was born in Widmore in Kent. In 1869 he traced the course of the old bed of the Hoang-ho River, and, with one Chinese servant, crossed Western Mongolia (1872). He explored part of the Pamirs (1885), and indicated the true sources of the Oxus.



Charles William Eliot.

Elihu, one of the speakers in the Book of Job.

Elijah (in the New Testament *Elias*), the Tishbite, the most impressive figure among the Hebrew seers. His life and work were largely a contest with the corrupt and degrading cult of Baal favored by King Ahab. Elijah produced an indelible impression upon his contemporaries and upon posterity. The Jews in the time of Jesus looked forward to

his return before the coming of the Messiah. He is also the hero of many legends among various other peoples.

Eliot, Charles William (1834-1926), American educator, was born in Boston, Mass., the son of a mayor of that city. In 1869 he was called to the presidency of Harvard University. During his administration the system of elective studies superseded that of prescribed courses in the institution; Harvard took the lead, also, in many other educational reforms under his guidance, and its material prosperity was greatly enhanced.

Dr. Eliot published (with F. H. Storer) *Manual of Inorganic Chemistry* (1866); *American Contributions to Civilization, and Other Essays* (1897); *Educational Reform: Essays and Addresses* (1898); *University Administration* (1908); *Annual Reports* as President of Harvard from 1869 to 1909. His selection of a five-foot shelf of books, 'the faithful and considerate reading of which will give any man the essentials of a liberal education,' aroused widespread interest.

Eliot, George (1819-80), the pseudonym of **Mary Ann or Marian Evans**, English novelist. She was born Nov. 22, 1819, at Arbury farm, in the parish of Chilvers Coton, Warwickshire, and there passed the first twenty-one years of her life.



George Eliot.

On May 31, 1849, her father died, and that summer she visited the Continent. After returning to England, she was for a time (1851-3) assistant editor of the *Westminster Review*, and while occupying that position formed many delightful friendships. It was through one of

these new friends—Herbert Spencer—that she met George Henry Lewes with whom in 1854 she formed a union, which, however, circumstances prevented from being legalized as marriage.

The publication of *Adam Bede* in 1859 placed George Eliot with the greatest English novelists. In April, 1860, appeared the autobiographical *Mill on the Floss*, a remarkable piece of self-revelation and analysis of a child's emotions and reactions, but not generally considered the equal of *Adam Bede*. In 1861 George Eliot published the exquisite little story, *Silas Marner*, by many thought to represent her powers at their best. A sojourn in Florence in the summer of 1861 resulted in *Romola*, which appeared in *Cornhill Magazine* in 1862-3. The new departure met with great success. *Middlemarch*, published in eight parts, 1871-2, a portrait of circles familiar to her in her youth, met with immediate success, but to most readers it lacks the charm of her earlier work.

Consult J. W. Cross' *George Eliot's Life* (3 vols.); *George Eliot*, by Mathilde Blind, in 'Eminent Women Series'; *George Eliot* (1890), by Oscar Browning, in the 'Great Writers Series,' and Stephen's *George Eliot*; Haldane's *George Eliot and her Times* (1927).

Eliot, John (1604-90), American clergyman, 'the Apostle to the Indians,' was born in England. Having conceived the project of organizing the Indians into a Christian community, he made an exhaustive study of their language, translated the Bible and the Bay Psalm Book, which he had written with Richard Mather and Thomas Welde, and established communities of 'praying Indians.' Among Eliot's works are an *Indian Grammar* (1666) and *Indian Primer* (1669).

Eliot, Thomas Stearns (T. S.) (1888-), English poet, born in the U. S.; was educated at Harvard and Oxford Universities. His works include *Prufock* (1917), *The Waste Land* (1922), *Ash Wednesday* (1930), *For Lancelot Andrewes* (1928), *Four Quarters* (1943).

Elisha, prophet of Israel and the successor of Elijah. He was the son of Shaphat and of the tribe of Issachar. Elisha is canonized in the Greek Church, his festival falling on June 14.

Elixir, in pharmacy, certain aromatic drug compounds held in solution by alcohol. They are used chiefly as a vehicle for various drugs and have little potent action save for the alcohol they contain.

Elizabeth, city, New Jersey. It was the

home of Gen. Winfield Scott. Princeton University was founded here as the College of New Jersey; p. 109.912.

Elizabeth (1533-1603), queen of England, only child of Henry VIII. by Anne Boleyn, was born in Greenwich Palace on Sept. 6, 1533. Till she ascended the throne, she did not play an important part in English politics. On the



Queen Elizabeth. Queen of England,
1558-1603.

death of her half-brother, Edward VI., she took the side of Mary against Lady Jane Grey and the duke of Northumberland, but her identification with Protestantism aroused the suspicion of Mary, and led to her being implicated in Wyatt's rebellion in 1554, and thrown into the Tower. Subsequently she was strictly guarded at Woodstock, and her conformity to the Catholic ritual was probably the sole cause of her not being sent to the block.

On the death of Mary, Nov. 17, 1558, Elizabeth, then twenty-five years of age, was summoned to the throne. To an exceptional extent Elizabeth's history was bound up with that of England. For the significant political events of her reign, see ENGLAND AND WALES; for ecclesiastical affairs, REFORMATION; and for the Spanish attempt at conquest, ARMADA.

From her sixteenth to her fifty-sixth year, one matrimonial scheme or passion, not always remarkable for delicacy, succeeded another. Before she ascended the throne, her name was mentioned in connection with Admiral Lord Seymour; Edward Courtenay, son of the earl of Devonshire; the earl of Arran; Philip of Spain, who married Mary; and Philibert of Savoy. After she became queen, Philip renewed his courtship, while her hand was also solicited by or for Eric, king of Sweden, Henry III. of France, his successor Henry of Navarre, the Archduke Charles of Austria, and the duke of Alençon. Her heart was probably most touched, however, by Robert Dudley, earl of Leicester, an accomplished courtier. After Leicester's death, Robert Devereux, second earl of Essex, succeeded to his position as favorite, but was eventually beheaded in 1601.

The reign of Elizabeth was a remarkable period in English history. There was comparatively little domestic trouble, no foreign wars were waged, religious persecution had virtually ceased, and the people were free to turn to the pleasures and the arts of peace. Literature rose to unsurpassed heights, producing such masters as Shakespeare, Bacon, Spenser, Marlowe, Sidney, Ascham and Hooker, while in the more practical walks of life came Drake and Frobisher. Consult Strickland's *Lives of the Queens of England*; Froude's *History of England* (vols. vii.-xii.); Creighton's *Queen Elizabeth*; Hassall's *The Tudor Dynasty*; Beesley's *Queen Elizabeth*; Strachey's *Elizabeth and Essex*.

Elizabeth, Pauline Elizabeth Ottilie Louise (1843-1916), known in the literary world as 'Carmen Sylva,' queen of Roumania, was born near Neuwied in Germany, a daughter of Prince Hermann of Wied. She identified herself with the life of her subjects, interested herself in the native arts and industries, and became famous for her work for the wounded in the Russo-Turkish War. She published, mostly in German, several volumes of poetry, romances, and philosophical writings, including *Rumänische Dichtungen* (1881); *Pelesch Märchen* (1883); *Pilgrim Sorrow* (1883); *The Thoughts of a Queen* (1890).

Elizabethan Architecture. See **Architecture**.

Elizabeth (1876-), Queen of the Belgians, daughter of the Duke of Bavaria; married Albert I of Belgium, in 1900. Before her marriage she became a graduate nurse with a medical diploma. She was active during World War I in a military hospital and with the Red Cross.

Elizabeth Petrovna (1709-62), empress of Russia, daughter of Peter the Great and

Catherine I., succeeded to the throne in 1741. During her reign the Russians acquired part of Finland. She helped to found the University of Moscow. See also **RUSSIA**.

Elizabeth, Saint, of Hungary, known also as **Elizabeth of Thuringia** (1207-31), was a daughter of Andreas II., king of Hungary. She was famous for her charities and benevolences. Gregory IX. canonized her four years after her death. Kingsley's *Saint's Tragedy* (1848) is based on her life.

Elizabethtown, borough, Pennsylvania. It is the seat of Elizabethtown College, and of the Masonic Home of the Grand Lodge of Pennsylvania; p. (1940) 4,315.

Elk, the name in Europe of the great northern deer known in America as moose. See **MOOSE**. It still abounds in Northern Scandinavia and Russia, and is kept in certain forest preserves of Eastern Europe. The deer commonly called 'elk' in the Western United States is the wapiti, or American red deer. See **WAPITI**.

Elkesaites, a Judæo-Christian sect of Palestine in the 2d and following centuries, in belief and practice somewhat resembling the Essenes, but recognizing Jesus as a prophet. Their system was a mixture of heathenism, Judaism, and Christianity, tinged with Gnosticism.

El-Kharga, oasis and town, Egypt. The oasis is about 100 miles long and from 15 to 50 miles wide. In ancient times it contained many towns and settlements, of which ruins are found today. Chief among these are the ruins of the Temple of Hibis, the Temple of Nadura, and the Christian Necropolis which contains several hundred brick tombs. Kharga is the chief town of the oasis; p. of oasis 8,160; of town, 5,380.

Elk Hound, a small variety of the Eskimo sledge dog domesticated in Norway.

Elkin, William Lewis (1855-1933), American astronomer, was born in New Orleans. He was awarded the Lalande Prize by the Paris Academy of Sciences in 1908. He published accounts of his researches in various astronomical journals and in the *Transactions of Yale Observatory*.

Elkins, city, West Virginia. It is the seat of Davis and Elkins College; p. 8,133.

Elkins, Stephen Benton (1841-1911), American lawyer and legislator, was born in Perry co., Ohio, but removed to Missouri at an early age. He was a member of the National Republican Committee in 1872-84, and took an active part in the nomination and campaign of James G. Blaine. He was secretary of war in Harrison's cabinet (1891-3), and in 1894

was elected U. S. Senator from West Virginia where he had acquired large mining and railroad interests. In 1900 and 1907 he was re-elected to the Senate, and he took an active part (1905-6) in the discussion of Federal control of railroad rates. The Elkins Railway Act of 1903 bears his name (see *RAILROADS, Government Regulation*).

Elks, Benevolent and Protective Order of, a prominent benevolent and secret fraternity, with membership confined to American citizens; the outgrowth of a social coterie of theatrical folks which began meeting in New York City in the Fall of 1867, under the name 'The Jolly Corks.' 'The Jolly Corks' became the Benevolent and Protective Order of Elks on Feb. 16, 1868. The primary purpose of the order is to inculcate fraternity and good citizenship. There are 1424 lodges and over 500,000 members. The Order's official organ is the *Elks Magazine*, published by the Grand Lodge.

Ell, an old term derived from the length of the arm, and used to denote a measure of length varying in different countries; thus the Flemish ell was 27 inches, the Scotch 37, and the English 45.

Ellen's Isle, islet, Perthshire, Scotland; Scott centers much of the action of his *Lady of the Lake* on this island.

Ellery, William (1727-1820), one of the signers of the Declaration of Independence, was born in Newport, R. I. In 1776 he was chosen a delegate to the Continental Congress, and he continued a member until 1786.

Ellesmere, Francis Leveson-Gower Egerton, First Earl of (1800-57), English writer, was born in London. He was Chief Secretary for Ireland, 1828-30, and Secretary of War, 1830. His works include *Guide to Northern Archaeology* (1848); *Life of the Duke of Wellington* (1852); a translation of *Faust* (1823) and the poems *Donna Charitea* (1845) and *The Pilgrimage* (1856).

Ellesmere Land, a barren uninhabited Arctic island south of Grinnell Land and west of Smith Sound which separates it from Northern Greenland.

Ellet, Charles (1810-62), American engineer, was born in Penn's Manor, Pa. He built many iron and steel bridges in the United States, including the wire suspension bridge over the Schuylkill in Philadelphia, 1841-2, the first structure of the kind in the country, and a suspension bridge over the Ohio River at Wheeling. He is best remembered as the inventor of naval rams.

Ellice, or Lagoon Islands, a low-lying

group of islands in the Pacific, belonging to Great Britain. They comprise the islands of Nanomea, Nanumanga, Niutao, Vaitupu, Nui, Nukufetau, Funafuti, Nukuleilei, and Nuirakita, with an area of 14 sq. m. They are of coral formation and are mostly covered with cocoanut palms. The islands were proclaimed a British protectorate in 1892, and annexed in 1915. They are administered in conjunction with the Gilbert Islands; p. 3,741, nearly all Christians.

Ellicott, Andrew (1754-1820), American astronomer and engineer, was born in Bucks co., Pa. In 1789 he was appointed by President Washington to survey the land along Lake Erie north of Pennsylvania, and was the first accurately to measure the Niagara River, including the height of the falls and the descent of the rapids. In 1790 he was engaged in laying out the new national capital. In 1792 he was appointed surveyor-general of the United States, and from 1796 to 1800 was one of the commissioners to determine the boundary between the United States and the Spanish possessions.

Elliot, Charlotte (1789-1871), English hymn writer, was born probably in Clapham; is remembered for her hymns, notably *Just as I am, without one plea*, and *Christian, seek not yet repose*.

Elliot, Daniel Giraud (1835-1915), American ornithologist, was born in New York City. He made special expeditions into East Africa, 1896, and into the Olympic range, Washington, 1898, in behalf of the Field Columbian Museum, Chicago, in which he became curator of zoology. His works include: *New and Hitherto Unfigured Birds of North America* (1869); *The Phasianidæ, or Pheasants* (1872); *Land and Sea Mammals of Middle America and the West Indies* (1904).

Elliottson, John (1791-1868), English physician, was born in London; founded a hospital for hypnotic treatment, 1849, and began the publication of the *Zoist*, a periodical for the discussion of hypnotism. He was also a pioneer in the use of the stethoscope, though he cannot be regarded as the inventor of it.

Elliott, Charles Loring (1812-68), American portrait painter, was born in Scipio, N. Y. His 700 or more portraits include those of *Fitz-Greene Halleck*, *Matthew Vassar*, and *Fenimore Cooper*.

Elliott, Henry Wood (1846-1930), American naturalist, was born in Cleveland, Ohio. He was artist in the U. S. geological service in 1869-71, investigated the Alaskan seal islands in 1872-74 and 1890, and in 1905 pre-

pared the fur-seal treaty of 'mutual concession and joint control' which was later ratified by the United States, Canada, Japan, and Russia. He wrote *Monograph of the Seal Islands of Alaska* (1882), *Our Arctic Province* (1886).

Elliott, Jesse Duncan (1782-1845), American naval officer, was born in Maryland. He won the first American victory in the War of 1812 by capturing two British brigs near Fort Erie and in 1818 was promoted to the rank of captain. Consult *Jarvis' Biography*, and *Cooper's Battle of Lake Erie*.

Ellipse, a geometric curve, figure and conic section, intermediate to the circle and parabola. If a right circular cone be cut by a plane more inclined to the axis of the cone than is the side of the cone, the intersection is an ellipse. The ellipse is a closed curve, every point of which has the sum of its distances from two fixed points (foci), always the same.

Ellipsoid, a finite, continuously curved closed surface, the simplest after the sphere, which is a particular case of the ellipsoid. Every section of an ellipsoid by a plane is an ellipse or, in special cases, a circle. The ellipsoid has three rectangular axes of different lengths, and its section in any direction is an ellipse.

Ellis, George Edward (1814-94), American clergyman and historian, was born in Boston, Mass. From 1857 to 1864 he was professor of systematic theology at Harvard divinity school.

Ellis, Havelock (1859-1939). English writer and psychologist, author of *Studies in the Psychology of Sex*, 7 vols. (1897-1928.) He was credited with lifting the discussion of sex from the realm of the ribald to a plane of respectability by endeavoring to treat its manifestations as normal natural phenomena. His works include *The World of Dreams* (1911), *The Task of Social Hygiene* (1912), *The Dance of Life* (1923).

Ellis Island, a small island in New York harbor, a mile southwest of Manhattan Island, since 1892 the chief landing place for immigrants to the United States. See IMMIGRATION.

Ellsworth, Ephraim Elmer (1837-61), American soldier, was born in Mechanicsville, N. Y. At the outbreak of the Civil War he went to Washington and there organized a regiment of zouaves from the New York firemen, of which he was made colonel. He was shot at Alexandria, Va., by a hotel keeper.

Ellsworth, Lincoln (1880-), Ameri-

can engineer, explorer and aviator. After some mining experience in Alaska he organized the Ellsworth Expedition across the Andes, under the auspices of Johns Hopkins University, 1924. He in part financed and accompanied Amundsen's North Pole flight attempt in 1925, when their two planes were forced down and the party marooned on the ice for three weeks. He was backer and co-leader of the Amundsen-Ellsworth-Nobile Transpolar flight in the dirigible Norge, from Svalbard to Alaska, 1926, for which he received the Congressional Medal of Honor in 1931. Ellsworth organized an expedition for the crossing of Antarctica which set out in the Wyatt Earp in 1933, with an airplane on board. This expedition ended when the airplane was wrecked by a forced landing. A later expedition landed at Dundee Island, November 1935, and operated from that base with successful results. The newly discovered territory was named James W. Ellsworth Land, the last unclaimed land on earth. Ellsworth proved that the airplane could be a practical means for the solution of many antarctic problems. He received the National Geographic Society Hubbard Gold Medal, 1936.

Ellsworth, Oliver (1745-1807), American political leader and jurist, was born in Windsor, Conn. He was chief justice of the U. S. Supreme Court, 1796-1800, served as commissioner to France, with Murray and Davie, in 1799-1800, and in 1807 was made chief justice of the Connecticut Supreme Court but died before taking office.

Ellwood, Thomas (1639-1713), English writer; may be considered one of the later founders of Quakerism, having travelled with George Fox through England. He was also the friend of Milton, and was supposed to have suggested *Paradise Regained*. His works include *An Alarm to the Priests* (1660); also a sacred poem the *Davideis* (1712) and an autobiography (1714).

Elm, a genus of trees belonging to the family Ulmaceæ, and including sixteen known species distributed throughout the temperate parts of the world. They have simple unsymmetrical leaves, usually doubly serrate, small greenish inconspicuous flowers, and thin, circular winged samaras. The wood is tough, hard, and difficult to split, and is used for barrels, kegs, flooring, and piles, and in ship building.

Elman, Mischa (1892-), Russian violinist. He studied in Odessa under Fiedelman, and in 1899 made his debut. He appeared in

London in 1905, and in 1908 in America. He toured the U. S. 6 times, and now lives in New York City.

Elmira, city, New York, county seat of Chemung co. The State Reformatory, Elmira College for Women, Elmira Vocational School, and Elmira Free Academy are situated here. Other important institutions are the Arnot-Ogden Hospital and the Steele Memorial Library.

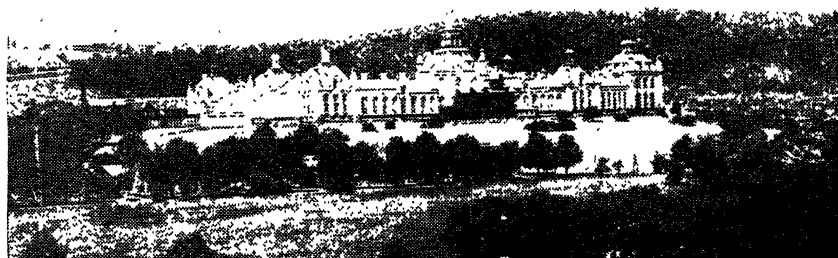
The city is situated in a fertile basin formed by the meeting of four valleys, and is a flourishing industrial center. Among the larger industrial establishments are rolling mills, bridge

Elohim, a common Hebrew name for the Deity, whose proper name was Yahweh.

Eloi, or **Eligius** (588-658), a saint in the Roman Catholic calendar. Eloi is said to have founded the Abbey of Ouen. He is the patron saint of jewellers.

Elon College, a coeducational institution at Elon, North Carolina, was chartered in 1869 and opened for students in 1891. The college presents a unique program of community service, consisting of four weekday schools of religion, a local grade school, an orphanage, and a school for adult colored people at night.

El Paso, city, Texas, county seat of El Paso



Elmira Reformatory. Elmira, N. Y.

works, foundries, valve, radiator and boiler works, tool, agricultural implement and fire-engine works, and railroad shops.

Elmira was settled in 1788. A monument to General Sullivan commemorates the victory of 1779, in which he crushed the force of Indians and Tories. Elmira was incorporated as a city in 1864; p. 45,046.

Elmira College, a non-sectarian institution for the higher education of women, at Elmira, New York, was founded in 1855 under Presbyterian auspices. It was the earliest woman's college to be established, and the first college in New York to require modern languages as part of its course. It confers the degrees of B.A., B.S. and M.A. on students in classical and scientific courses and B.S. on students of music.

El Mistí, a volcano in Peru, east of the town of Arequipa with an altitude of 19,200 ft.

El Obeid, or **Obeid**, capital of Kordofan in the Egyptian Sudan, Africa. Near the town, in November 1883, the Mahdi defeated and utterly annihilated the Egyptian army under Hicks Pasha; p. 16,000.

Elocution, that branch of oratory which teaches the proper utterance of speech, modulation of the voice, and the use of gesture.

co., on the Rio Grande River. The Texas College of Mines and Junior College, both affiliated with Texas University, St. Joseph's Academy, Loretta Academy, and a number of other private and sectarian schools are located here. As the principal gateway between the United States and Mexico, El Paso is an important port of entry. Its most important industry is mining. The city is the center of a great cattle range, and of a region rich in fine fruits and vegetables, cotton, and alfalfa. El Paso was settled in 1827. Fort Bliss, military post at El Paso, is headquarters for the First Cavalry Division of the U. S. Army; p. 96,677.

Elphinstone, **Mountstuart** (1779-1859), British statesman. From 1819 to 1827 he was governor of Bombay. His statesmanship freed the Deccan of banditti, and effected the settlement of the country, while his acquaintance with native languages made him the highest authority of his day on Indian affairs. He brought to Europe its first knowledge of Afghanistan, and gave native education in the Bombay Presidency its first impulse. He published *Persia and India* (1815), and a *History of India* (1815). Consult *Life* by Sir E. Colebrooke.

Elphinstone, William (1431-1514), Scotch prelate, bishop of Aberdeen and founder of King's College, Aberdeen, was born in Glasgow. He was instrumental in introducing the knowledge of printing into Scotland, and greatly contributed to the development of education.

Elsheimer, Adam (1578-1620), German painter, was born in Frankfurt-on-Main, and lived in Rome. Among his works are: *The Flight Into Egypt*, *Philemon and Baucis*, *Good Samaritan*, and *Ceres in the House of Becubus*.

Elsinore. See **Helsingor**.

Elson, Louis Charles (1848-1920), American music critic and teacher, was born in Boston, Mass.; was a member of the *Musical Herald's* staff, and in 1888 became music critic of the Boston *Daily Advertiser*, and was president of the Music Teachers' National Association in 1904. He was editor-in-chief of the *University Encyclopedia of Music*, 1911, and of *Famous Composers and Their Works* (new series), and associate editor of *The World's Best Music*.

Elstracke, Renold (c. 1590-1630), engraver, was born probably in Hasselt, in Belgium, and went to England about 1615. His chief work was a set of thirty-two engravings of the kings of England, 1618.

Elutriation is the process of separating the finer particles of an earthy substance from the coarser and heavier by washing with water.

Elvas, fortified town, Portugal, in the province of Alemtejo; is the seat of a bishop, has a cathedral and a fine old aqueduct, and is the strongest fortress in Portugal; p. 13,900.

Elwell, Francis Edwin (1858-1922), American sculptor, born at Concord, Mass. His most notable sculptures include *Death of Strength*, *Diana and the Lion*, *Egypt Awakening*, and *Dickens and Little Nell*.

Elwood, city, Indiana, Madison co. The oldest tin-plate works in the United States are situated here, and lawn mowers, kitchen cabinets, boxes, aluminum ware, and gravity meters, are manufactured. Elwood is also a farming community and has a large fruit jobbing house, and three tomato canning factories; p. 10,913.

Ely, city, England, Cambridgeshire, capital of the administrative county of the Isle of Ely and head of a diocese. The city owes its chief importance to its beautiful cathedral. Within the precincts are the bishop's palace, a theological college and Hereward Hall (King's grammar school). Etheldreda, wife of Egfred, king of Northumbria, founded here, about 673, a monastery for monks and nuns. It was de-

stroyed by the Danes in 870, and about 970 a Benedictine monastery was established. In 1100 this monastery was made the seat of a new bishopric taken from the diocese of Lincoln; p. 7,690.

Ely, city, Minnesota, in St. Louis county. It has some of the most valuable iron mines of the famous Lake Superior iron region, as well as lumber mills and extensive gardening and berrying industries; p. 5,970.

Ely, Richard Theodore (1854-1943), American economist, was born in Ripley, N. Y. He was professor of political economy at Johns Hopkins University in 1881-92, and professor of economics at the University of Wisconsin after 1892. He was one of the founders and successively secretary and president of the American Economic Association, and in 1904 founded the American Bureau of Industrial Research. Professor Ely was the first president of the American Association for labor legislation, and was founder and director of the Institute for Research in Land Economics and Public Utilities. His published works include: *Taxation in American States and Cities* (1888); *Introduction to Political Economy* (1889); *Studies in the Evolution of Industrial Society* (1903); *Property and Contract in their Relation to the Distribution of Wealth* (1914); *Foundations of National Prosperity* (in collaboration, 1917).

Elyria, city, Ohio, county seat of Lorain co. Berea limestone is shipped from here. Manufactured products include bicycles, phonographs, core drills, linseed oil, automobiles, stoves and furnaces, telephone supplies, glycerine, adding machines, golf goods, and hospital vehicles; p. 25,031.

Elysium, or the Elysian fields, according to Homer, a region on the west of the earth near the ocean. It was a favored land, free from snow, rain, and cold, and to it chosen heroes passed without dying.

Elytra, or 'sheaths,' the anterior wings of beetles, which are converted into hardened wing-covers, having for their object the protection of the delicate gauzy wings beneath. The elytra are often beautifully marked and sculptured, and usually entirely conceal the abdomen.

Elze, Friedrich Karl (1821-89), German writer and critic of English literature, was born in Dessau. His works include: *Essays on Shakespeare* (1874); *Notes on Elizabethan Dramatists* (new ed. 1889); *Lives of Scott* (1864) and *Byron* (3d ed. 1886).

Elzevirs, a Dutch family of bookbinders, booksellers, publishers, and printers. The ear

liest of them, Louis Elsevier, was born in Louvain about 1542, and began publishing on his own account at Leyden in 1592. He died in 1617. Of his sons, the eldest and the youngest, Matthias and Bonaventura, took over the Leyden business; Louis II. worked at The Hague, and Jodocus, at Utrecht. Isaac, a son of Matthias, started a printing-house at Leyden in 1616, and in 1625 sold this to his brother Abraham and uncle Bonaventura, with whom the reputation of the family begins.

After the deaths of Bonaventura and Abraham in 1652, the business was continued by their sons Daniel and John. In 1655 Daniel Elsevier removed to Amsterdam, the Leyden business being carried on till 1661 by John, then by his widow Eva, and then by their son Abraham II., who died in 1712. The Amsterdam business, to which Daniel transferred himself, had been founded in 1637 by Louis II., son of Jodocus Elsevier. It was carried on by Louis and Daniel till 1664. In 1681 the business was sold by Daniel's widow, and passed out of the family.

Emancipation Proclamation, a proclamation issued Jan. 1, 1863, by President Lincoln, declaring free all slaves in the States then 'in rebellion against the United States.' The proclamation did not apply to those parts of the Confederate States (55 counties of Virginia, including 48 which later became West Virginia, and 13 parishes of Louisiana) then under actual Federal jurisdiction, and as the other parts were as yet unconquered and as the President therefore had no actual power, as commander-in-chief, over them, some constitutional lawyers have contended that no slaves were really emancipated. At all events, the slaves in the Border States and in the excepted districts were not freed until the adoption of the Thirteenth Amendment. In fact, however, freedom followed the conquering Federal armies between 1863 and 1865. See UNITED STATES, *History*.

Emanuel I. (1469-1521), became king of Portugal in 1495. Through his exertions Portugal became the first naval power of Europe, and the center of the commerce of the world. At home he improved the laws, reformed the administration of justice, and encouraged education and the arts.

Emba, a river in the province of Uralsk, Asiatic Russia, rises on the western slopes of the Mugoyar Hills, and flows s.w. 380 m. to the Caspian Sea.

Embalming. The art of preserving dead bodies from decay was widely practised among the ancients, and was carried to its greatest

perfection in Egypt. The body so preserved was there called a mummy. This art seems to have derived its origin from the idea that the preservation of the body was necessary for the return of the soul to the human form after it had completed its cycle of existence. The art appears as old as 4000 B.C. at least, for the bodies of Cheops, Mycerinus, and others of the age of the fourth dynasty, were embalmed. There were three methods of embalming, the method chosen by the relatives of the deceased depending upon his rank and means. The first process described cost one talent of silver, the second twenty minæ, and the third, which was very simple, cost very little.

So effectual were some of these processes that after 2,000 or 3,000 years the soles of the feet are still elastic and soft to the touch. The sacred animals were also mummified. It has been computed that since the practice began in 4000 B.C., down to 700 A.D., when it practically ceased, probably as many as 730,000,000 bodies were embalmed in Egypt. The elaborated art of embalming was probably never lost in Europe. The development of modern methods may be said to date, however, from the beginning of the 18th century.

In the United States, embalming may be said to have come into use through the successful work of Dr. Thomas Holmes, of Brooklyn, N. Y., who embalmed many bodies of dead soldiers upon the battlefields of the Civil War, and sent them home to friends. It is now customary to embalm every dead body. Consult Pettigrew's *History of Mummies*; W. Budge's *The Mummy*; Eckles' *Practical Embalmer*; Nunnemaker and Dhonau's *Hygiene and Sanitary Science* (1913).

Embankments, in engineering, are masses or structures of earth, rock, cement, etc. erected as defences against rivers, lakes, and the sea, for the formation of dams and reservoirs, or to carry railways, roads, and canals over depressions or at an elevation. Embankments are also used in irrigation. The vast embankments constructed to restrain the floods of the Mississippi River are known as levees. See EARTHWORK; EXCAVATION AND EXCAVATORS; DYKE; DAMS; RESERVOIRS; RETAINING WALLS.

Embargo signifies a decree of a government intended to place temporary restrictions on foreign trade. It may apply only to specific ports, or to all the ports within the jurisdiction of the government; may affect only certain classes of goods, or all goods; may interdict only trade with one or more countries, or with all countries; and may prohibit vessels and



Photo by Ewing Galloway, N. Y.

Ely Cathedral.

goods both from entering and leaving its ports, or merely the one or the other. An embargo may be imposed simply in view of domestic circumstances, as where in time of famine an embargo is laid on the exportation of food-stuffs; or it may be a form of reprisal for wrongs committed by a foreign power, or a part of a regular campaign. In the two latter cases the seizure of all ships belonging to the offending or enemy state found in the ports of

the country imposing the embargo may be involved.

Embassy, in its stricter sense, is a mission presided over by an ambassador, as distinguished from a mission or legation entrusted to an envoy or other diplomatic minister. See **AMBASSADOR**; **DIPLOMATIC SERVICE**.

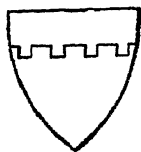
Embattled, **Imbattled**, or **Battled**, in heraldry one of the partition lines in the form of the battlements of a wall. The containing



Signing the Emancipation Proclamation.
(From the Carpenter Painting in the National Capitol.)

lines of the ordinaries may also be embattled.

Ember Days, days of fasting and special prayer in the calendars of the Roman Catholic, Anglican, and Protestant Episcopal churches, the dates being fixed in the 11th century for



Embattled (Heraldry).

the Wednesday, Friday, and Saturday after the first Sunday in Lent, after Pentecost Sunday, after Sept. 14, and after Dec. 13.

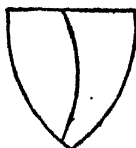
Embezzlement is the fraudulent appropriation of the property of another by one to whom it has been entrusted and is a statutory offense both here and in England.

Emblem, a figure or conventional representation, as a badge or picture. See **SYMBOLISM**.

Emblements is a term used to denote the right which a lessee has after the expiry of his lease to re-enter on the lands and take away such crops and vegetables as have been raised by his own exertions. See **LANDLORD AND TENANT**; **LEASE**.

Embolism, the term applied to the pathological obstruction of blood vessels by emboli—shreds of fibrin, fat globules, portions of thrombus (clot), or minute vegetations from diseased heart valves; but occasionally large clots are borne along by the blood stream. An embolus, when carried into an artery or arteriole whose caliber is too small to allow of its further progress, plugs the vessel, cuts off the blood supply to the parts beyond, and causes a stasis (stagnation) of the blood in the immediate neighborhood. Stagnant blood speedily coagulates, so that thrombosis takes place around the embolus, and the lumen of the vessel is occluded and obliterated.

Embossing. See **Chasing and Embossing**.



Embowed (Heraldry).

Embowed, in heraldry, said of certain objects when curved or bent. The angle or curve

should be toward the dexter. If toward the sinister, it is counter-embowed.

Embracery consists in attempting to influence a juror or one summoned as a juror in a civil or criminal action by money, promises, threats, or other unlawful means, and is punishable by fine or imprisonment.

Embrasure, in architecture, refers to the enlargement of the aperture of a door or window on the inside of the wall by slanting the sides. In military architecture embrasures are the rectangular gaps in a battlement. See **FORTIFICATION**.

Embroidery is the art of reproducing patterns on textiles or leather, in threads of silk, wool, linen, or metal, by means of a needle. The oldest embroideries extant are on mummy clothes, and date back to the earliest historic period in Egypt. Eastern embroidery remains today, in workmanship and design, what it was a thousand years ago, while the influence of centuries and circumstances is clearly recorded in Western examples. To Europe the art came from Byzantium. Its introduction into Italy was in connection with the early Christian Church; and the favorite Byzantine arrangement of a pair of animals or birds, separated by the Persian tree of life was largely employed in mediæval ecclesiastical work.

During the Crusades embroidery was used for heraldic devices. Through heraldry, embroidery came into general domestic use. The Middle Ages saw the perfection of the craft, English workers excelling all others; their handiwork, as seen in the Bayeux tapestry and the Syon Cope, has never since been equalled.

Embroidery is of three kinds:—Outline embroidery, worked in rope stitch, chain, coral, cable, stem or split stitch. Flat mass, popularly known as the ecclesiastical stitch, inlaid work or couching of some material cut out in pattern and fastened to the face of the work by a solid outline in onlaid appliqué; while in inlaid appliqué the pattern is cut out of the ground, and material applied at the back. Shading, carried out in embroidery or feather stitch, consists of broken masses giving the effect of relief; in this variety padding is used to heighten the effect. See L. F. Day and M. Buckle's *Art in Needlework* (1901); A. Dolby's *Church Embroidery* (1867); Kendrick's *English Embroidery* (1905).

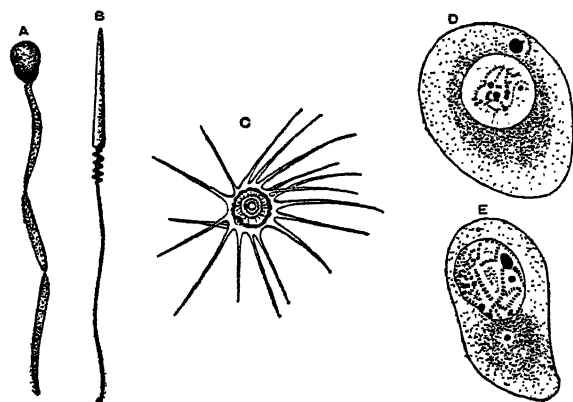
Embryology is the science of the development of organisms, especially in the earlier stages of their life-history. Embryology has to do with all the developmental changes in the life-history of the individual; the embry-

ologist's inquiry should not be too rigidly restricted to the study of egg or embryo, larva or foetus. Its sphere is coextensive with the word 'development.'

In all ordinary cases of sexual reproduction the individual life begins in the union of the nuclei of two germ-cells, the ovum and the spermatozoon. In the majority of animals, and in almost all plants, the germ-cells are not distinguishable as such until relatively late in the life-history. Inferring, however, from the cases which are clear, most biologists now suppose that in all cases the germ-cells are those elements which have retained intact the characteristic organization or germ-plasm of the fertilized ovum, and that they owe to this

cells of an animal is definite and constant for each species (with a few explicable exceptions), and the result of the maturation process is that the number of chromosomes in the egg which is now awaiting the essential act of fertilization is half that which is characteristic of the body-cells of the animal. But during the history of the paternal germ-cells (spermatogenesis) a somewhat similar process of reduction in number of chromosomes has also taken place, so that when ovum nucleus and sperm nucleus come together in fertilization, the number of chromosomes characteristic of the species is obviously to be found in the fertilized egg-cell.

Although there are many different ways in



Types of Germ-cells.

A. Spermatozoon of pike, showing head, middle-piece, and tail. B. Spermatozoon of duck; the head is pointed and the middle-piece spiral. C. Spermatozoon of spider-crab, showing the type found in Crustacea. D. Ovarian egg of young duck; beside the large nucleus is a yolk nucleus. E. Egg of newborn cat, showing attraction sphere and centrosome lying below nucleus.

their unique power of development, or of re-expressing the specific qualities of the race.

In the great majority of animals the nucleus of the ripe ovum divides twice in rapid succession, and two minute cells or polar bodies are given off. These come to nothing, though one of them may again divide; they are most plausibly regarded as 'abortive ova,' unsuccessful sister cells of the ovum which has extruded them. But in many cases it is clear that, as the result of this twofold division, the remaining nucleus of the ovum has suffered a reduction in the number of readily stainable bodies or chromosomes by one half. The number of these chromatin bodies or chromosomes in the

which the male and female germ-cells are brought together, the gist of the fertilization process is always the same—that the two sex-nuclei enter into intimate and orderly union. The ovum is usually a relatively large cell, and may become gigantically swollen with a store of yolk; it is a very passive cell—the outcome of a relative preponderance of constructive or anabolic processes. The spermatozoon is a relatively minute cell, sometimes only about 1-100000 the size of the ovum; it has a very small quantity of cytoplasm, is usually adapted for active locomotion, and is the outcome of a relative preponderance of disruptive or katabolic processes. The typical

ovum is a spherical cell with a vitelline membrane; the typical spermatozoon has a head consisting chiefly of nucleus, a long locomotor tail, and a small middle piece connecting the two. There is considerable evidence in support of the conclusion that, in the animal spermatozoon, the stimulating something is closely associated with a little body known as the centrosome, and contained in the already-mentioned middle piece. But this centrosome cannot be found in the higher plants.

During their early stages in the ovary the ova are devoid of yolk granules, but a store of these is gradually accumulated. Sometimes an ovum of amoeboid character literally devours its sister-cells, and grows rich at their expense; often the yolk granules are elaborated in special cells, which form a follicle round the ovum and surrender the yolk to it; sometimes there are special yolk glands. In any case, the meshes of the egg cytoplasm always come to contain some yolk; and a distinction may be drawn between the formative protoplasm, out of which the embryo is directly developed, and the accessory not-living deutoplasm consisting of yolk, which is simply nutritive.

The amount of food-yolk is, of course, a factor in determining the size of the egg, and also a factor in determining the degree of development which the embryo can attain before hatching. When the eggs are large, there are fewer of them, but the young are hatched or born with a better chance of survival; when the eggs are very numerous, they are small, and there is great mortality among the immature larvæ, as may be illustrated by the case of oysters.

Another influence of food-yolk is seen in the varied rates of development. 'The immediate effect of a large amount of food-yolk is mechanically to retard the processes of development; the ultimate result is greatly to shorten the time occupied by development. This apparent paradox is readily explained.' The egg of the lancelet, relatively free from yolk, makes a rapid start, and is soon hatched as a larva; but since the larva has to expend much energy in procuring and digesting its food, its further development proceeds more slowly.

After fertilization has been accomplished, the ovum, whether of plant or animal, proceeds to divide into segmentation-cells or blastomeres. The mode of segmentation or cleavage depends mainly on the amount and distribution of the food-yolk. (1.) When the amount of yolk is not very large in proportion to the amount of formative material, or when the separation of the two is not very marked, the

whole egg may divide into two, four, eight, sixteen, etc., blastomeres, which may be equal in size, as in the starfish, or unequal, as in the frog. (2.) When a relatively large quantity of yolk has accumulated by itself towards one pole, or when it has become condensed in a central core, the segmentation is partial, for only the formative protoplasm exhibits division. The result may be, as in birds and reptiles, a disc of cells on the top of a mass of yolk; or, as in most arthropods, a peripheral envelope of cells enclosing a nutritive core. Technically, there may be discoidal or peripheral meroblastic segmentation. The process of segmentation results in an embryonic form, such as a solid ball of cells (morula) or a hollow ball of cells (blastula), or an oval planula, and so on.

Another problem which no longer appears so simple as it did a quarter of a century ago is that of the germinal layers. In different ways in the different types the cells of the animal embryo become arranged in layers—an outer layer (epiblast, or ectoderm), an inner layer (hypoblast, or endoderm), and between these a less definable stratum (mesoblast, or mesoderm). On the whole these layers give rise to similar structures in each case; thus, the ectoderm forms the epidermis, the nervous system, the foundations of the sense organs, etc.; the endoderm lines the mid-gut and all the outgrowths from it; the mesoderm forms muscle, most of the skeleton, and so on.

For many years it seemed as if it were securely established that the three germinal layers were of constant occurrence in the development of multicellular animals; that they were exactly comparable throughout the series, ectoderm with ectoderm, and endoderm with endoderm; and that they gave rise (with few exceptions) to similar structures wherever or however they occurred. But few embryologists would now agree with these statements. The recoil from the germ-layer theory has also been corroborated by the numerous remarkable experiments which have shown that the early cell arrangements may be sometimes profoundly disturbed by artificial interference without affecting the normality of the resulting larvæ.

The mutual influence of evolution theory and embryology led to the formulating of the 'recapitulation doctrine,' which expresses the conclusion that individual development is in some measure a recapitulation of the racial history, or that ontogeny tends to recapitulate phylogeny. The idea that individual development repeats racial history found for a time

much favor among zoologists (though little among botanists); of recent years it has been regarded with increasing distrust. At present, therefore, it seems wisest to use the recapitulation idea very cautiously and critically.

Another idea which has sprung from the mutual influence of evolution theory and embryology is expressed in Kleinenberg's theory of the substitution of organs. A new organ sometimes seems to arise out of an old one by a change of function and structure of either part or whole. The eustachian tube which runs from the superficial tympanum of the frog past the ear to the posterior corner of the mouth seems to be a gill-cleft which has undergone functional change; what were primitively gill-arches may form the skeleton supports of the larynx; the unimportant cloacal bladder of the frog seems to be represented in reptiles, birds, and mammals by the fundamentally important foetal membrane known as the allantois. But in addition to this process of the transformation of an old organ into a new one, there seems to be another process by which an old organ is replaced by a new one, and, in a sense, prompts the substitution. Thus in all vertebrate embryos there is a supporting axial rod or notochord, developed from the endoderm along the dorsal median line of the gut; it persists throughout life in some old-fashioned types like the lampreys and hags, but from fishes onwards it is gradually replaced by the mesodermic vertebral column. The general idea of one structure leading on to or preparing the way for another is suggestive of how new structures, too incipient to be of use, and old structures, too transitory to be functional, do nevertheless persist.

Within recent years there has been a remarkable development of experimental embryology along a number of different lines. (1.) Attempts have been made to get nearer an understanding of the external conditions of normal development, by observing what happens when developing ova are placed in new conditions of pressure, gravity, chemical medium, temperature, and so on. (2.) By puncturing adjacent blastomeres or by shaking the blastomeres apart, it has been possible to discover how an isolated blastomere will develop; and this method has shed some light on the morphological problem of cell-lineage and on the general theory of development. (3.) By injections of various toxins, by rapid rotations of the eggs, by altogether unusual conditions of pressure and temperature, it has been found possible to induce monstrosities which have in some cases helped towards an interpretation

both of normal development and of teratological phenomena which often occur in the course of nature.

While the description of the facts of development is becoming every day clearer and more precise, we are not in a position even to conceive how a complex organization lies implicit in a germ-cell, or to state how it is realized in the progressive differentiations and integrations which development implies, or to interpret the co-ordinated fitness and unity which is manifest from the beginning to the end.

See further: E. B. Wilson's *The Cell in Development and Inheritance* (1900); Weismann's *Germplasm* (1893); Geddes and Thompson's *The Evolution of Sex* (1901); Milnes Marshall's *Vertebrate Embryology* (1893); J. W. Jenkinson's *Experimental Embryology* (1909); T. H.



Ralph Waldo Emerson.

Morgan's *Experimental Embryology* (1927); C. M. Childs' *Physiological Foundations of Behavior* (1924); L. B. Arey's *Developmental Anatomy* (1930).

Emden, seaport town, Prussian province Hanover; chief industries are shipbuilding, the manufacture of paper, ropes, woollens, cement, and tanning. About 1,000,000 tons of sea-

going merchandise enter the port every year; p. 33,000.

Emerald, a precious stone of green color (h. = 7 1-2, sp. gr. 2.7). It is really a variety of beryl, and the paler-colored bluish-green specimens are included under aquamarine. It was much valued by the ancients, though under the name 'smaragd' they seem to have included many other stones which resembled the emerald in color. Emeralds are now obtained from Siberia, New South Wales, and Colombia. No stone varies more in quality than this. The deep green velvety stones are most esteemed; the color is believed to be due to small traces of oxide of chromium. The 'Oriental emerald' is a green corundum, and is very rare and precious.

Emerson, Benjamin Kendall (1843-1932), American geologist, born at Nashua, N. H., was professor of geology and mineralogy at Amherst; was appointed assistant U. S. geologist, and became president of the Geological Society of America.

Emerson, Ralph Waldo (1803-82), American poet and philosopher, was born May 25, 1803, at Boston. His father was the Rev. William Emerson, pastor of the First Unitarian Church of that city, and many of his forebears were clergymen. William Emerson is remembered as an organizer of the Boston Anthology Club, formed in 1804 to carry on *The Monthly Anthology and Boston Review*, which came to an end about the time of his death in 1811. After this event Ralph Waldo's education was continued under the supervision of his mother, and he also came much under the influence of his father's sister, Miss Mary Moody Emerson. Emerson attended the Boston Latin School, and graduated 1821 at Harvard. He does not seem to have made any great impression upon his classmates, and his honors were confined to a second prize in composition and his selection as class poet. After graduation he taught in his elder brother's school for a while, and in 1823 began to study for the ministry, at the same time attending lectures at the Cambridge Divinity School. In 1829 he was elected assistant and afterwards sole minister of the Second Church, Boston, a Unitarian congregation; but in 1832 he resigned for conscientious reasons, declaring in a farewell sermon his scruples against administering the ordinance of the Lord's Supper. He continued to preach at various churches, however, with some regularity until 1838. A part of 1833 was spent in Europe, where he made the acquaintance of Landor, Coleridge, and Wordsworth, and visited Carlyle at Craigenputtock. Between

Carlyle and himself a lifelong friendship existed, Emerson editing the first American edition of *Sartor Resartus*, 1836, and each acting as literary agent for the other in their respective countries. On his return to America, Emerson took up his permanent residence in Concord, Mass., preparing there the lectures which he delivered in Boston and vicinity. The year 1836 was signalized by the publication of the earliest and perhaps most important of his works, the tractate on *Nature*, and by those meetings at Emerson's house of a few like-minded thinkers who became known as the Transcendental School. In this year, also, he wrote the memorable 'Concord Hymn' for the dedication of the monument raised in commemoration of the Concord fight. Emerson's name was next brought into public notice by his oration before the Phi Beta Kappa Society, August, 1837, on *The American Scholar*, which Dr. Holmes afterward described as 'the intellectual declaration of independence' of America, and by a discourse delivered to the graduating divinity class at Cambridge, July, 1838.

His first series of *Essays* appeared in 1841, and a second series in 1844; while in 1840 he assisted at the founding of *The Dial*, the organ of New England transcendentalism, contributing to its pages more than forty prose and metrical pieces. The publication was at first edited by Margaret Fuller; on Miss Fuller's retirement, Emerson took up the editorship, and conducted the periodical until its discontinuation in 1844. He was also at this time a curious observer of the Brook Farm experiment, in which he did not take part. His *Poems* were published in 1847. In 1850 he produced *Representative Men*, and in 1860 appeared *The Conduct of Life*, a series of essays on 'Power,' 'Culture,' 'Behavior,' etc., which served as a guide to manners for more than one generation of Emerson's disciples. On the conclusion of the Civil War he published his *Mayday and Other Pieces*, 1867, followed, 1870, by a prose volume, *Society and Solitude*. In 1874 he published *Parnassus*, an anthology of English verse; while a final volume of essays, *Letters and Social Aims*, 1875, was prepared from his earlier lectures. He died April 27, 1882.

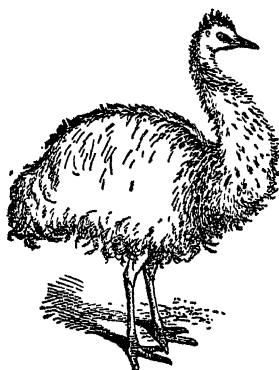
The key to Emerson's mental position is to be found in his intense individualism. Like Carlyle, he was a pantheist, and his optimism is the logical result of his pantheism. Emerson's one real contribution to philosophy is his insistence on the identity of physical and moral law: the same laws govern a state and an acid. His attitude toward science is, throughout, that of the poet and Platonist who views the

phenomena of nature only as so many adumbrations of ideal truths.

The authorized life is the *Memoir* by James Elliot Cabot (1887). Other biographical works are *Emerson*, by O. W. Holmes (American Men of Letters Series, 1885); *Emerson in Concord*, by E. W. Emerson, his son (1888); *The Correspondence of Thomas Carlyle and Ralph Waldo Emerson*, edited by Charles Eliot Norton (1883). The complete works, including posthumous material, are published in the Riverside edition, edited by J. E. Cabot (1833-4; 11 vols., 8vo).

Emery is an impure variety of crystalline corundum, Al_2O_3 , being mixed with the oxides of iron, haematite, and magnetite. The large blocks are reduced to powder, which is then sifted and graded into various degrees of fineness. The finest flour emery is prepared by elutriation, in which the powder is mixed with a large quantity of water and allowed to stand. The coarsest grains settle first, the finer particles being held longer in suspension. Emery is a purple-black solid, which is next in hardness to the diamond, and hence is used as an abrading and polishing agent for cutting and grinding glass, metals, and the less hard of the gems.

Emetics, in medicine, substances given, in various ways, to bring about vomiting. They may be given by the mouth, or hypodermically, and may act by direct irritation of the stomach, or indirectly by stimulation of the vomiting center in the brain.



Emeu.

Emeu, or **Emu**, one of the running birds, or *Ratitæ*, and a near relative of the cassowary. There are two species, *Dromaeus nova-hollandia* and *D. irroratus*, both confined to the Australian region.

Emigration, a movement of population, inspired in the main by economic or personal reasons. In its broadest sense the word would apply to the movement of persons from one part of a country to another, but as commonly used it means the removal from one country to another. Emigration first became a notable movement of population during the 19th century. For long it was discouraged by most European powers through fear of depopulation, but nevertheless it continued to assume ever larger proportions until in the years just preceding the Great War it had reached record figures. The majority of the British emigrants went to British colonies, with a large number, mostly Irish, going to the United States. The Italians went largely to the United States and South America, and the Scandinavians and Germans went mostly to the United States. While Germany, France, and Switzerland undoubtedly received annually many thousand foreign laborers, nevertheless the United States was the leading immigration country, two thirds of those who came remaining there definitely. Like all other aspects of social and economic life, emigration was deeply affected by the Great War. Large numbers of emigrants returned home during the course of the conflict and the tide of emigration into practically all countries ceased for the period of the conflict. See **IMMIGRATION**. Consult L. G. Brown's *Immigration* (1933); M. R. Davie's *World Immigration* (1936).

Emigrés, a term applied to those Frenchmen who left their country in consequence of the French Revolution. The first considerable 'emigration' followed the fall of the Bastille on July 14, 1789. These emigrés, headed by the Comte d'Artois, brother to Louis XVI., and Calonne, an ex-minister of finance, went, some to England, some to Italy, but the greater number to the German states on the Rhine frontier.

Emilia, former division of Italy, embracing the modern provinces of Bologna, Ferrara, Forlì, Modena, Parma, Piacenza, Ravenna, and Reggio, all stretching from the Apennines to the Po and the Adriatic; area, 8,566 square miles; p. 3,033,113.

Eminent Domain, the power of the state to appropriate private property for public use. The Constitution of the United States provides, in the fifth amendment thereto, that private property shall not be taken for public use without just compensation. This provision is binding upon Congress but not upon the States. The constitutions of all of the States, however, except North Carolina, contain similar provisions, and the principle is universally

recognized that private property can be taken by the State only upon the payment of just compensation to the owner. The right may be exercised directly by the State or may be delegated to municipalities, private corporations, or individuals. The legislature is the judge of the necessity for and the mode of exercise of the power, except that the taking must be with due process of law, which necessitates notice to the owner, and the court may review the question as to whether the proposed use is in fact a public one.

Emin Pasha (1840-92), naturalist, scientist, and administrator, was born in Oppelin, Silesia, son of a Jewish merchant, his real name being Eduard Schnitzer. He went to Turkey and at Scutari was appointed on the staff of Hakki Pasha, adopting a Turkish name and habits to disarm prejudice. He then entered the Egyptian medical service, and Gordon appointed him chief medical officer and governor of the Equatorial Provinces, 1878. When the great rebellion entailed Egypt's abandonment of the Sudan, Emin was completely isolated but he was unwilling to leave. He never regained his old influence however and was killed by Man-yemas at Moumena.

Emir, Ameer, Amir, a title assumed by independent tribal chiefs in the East and in North Africa. When emir is joined to another word expressive of a particular command or office, it is a title of dignity, as Emir-Hajji, the leader of the pilgrim caravan to worship at Mecca.

Emmenagogues, drugs used to promote the regular appearance of the menstrual flow in women.

Emmerich, town, Prussia, in the Rhine province, on the north bank of the Rhine. Features of interest are the Aldegundis-Kirche on the site of a church founded by St. Willebrord; the Münster-Kirche containing many ancient treasures, and the Rathaus erected in 1417. During the 17th and 18th centuries it was the seat of a famous Jesuit school; p. 13,165.

Emmett, Daniel Decatur (1815-1904), American negro minstrel and song writer, was born in Mount Vernon, O. He organized the negro minstrel troupe, called the 'Virginia Minstrels,' in 1842, which opened at the Chatham Square Theatre in New York. His song *Dixie* was written in 1859. Other popular songs are *Old Dan Tucker*, *Boatman's Dance*, and *Walk Along, John*.

Emmons, Ebenezer (1799-1863), American geologist, was born in Middlefield, Mass.; became geologist-in-chief of the second district

of the geological survey of New York State; and in 1858 was placed in charge of the geological survey of North Carolina.

Emmons, George Foster (1811-84), American naval officer; served in Wilkes' exploring expedition from 1838 to 1842. In 1866-8, as commander of the *Ossipee*, he conveyed the U. S. commissioners to Alaska, to receive possession of that territory.

Emmons, Samuel Franklin (1841-1911), American geologist; in 1879 he was given supervision of the Colorado division of the U. S. Geological Survey. He published *Statistics and Technology of the Precious Metals* (1885); *Geology of the Denver Basin in Colorado* (1896); *Geology of the Government Explorations* (1896); also other works and many papers in scientific journals.

Emollients, those medical drugs and other means which soften and relax the tissues. Those used internally are usually termed 'demulcents'—'emollient' being reserved for outward applications, such as fomentations, ointments and oils, poultices, and inhalations of steam or other vapor.

Emory, John (1789-1835), American M. E. minister, was born in Queen Anne co., Md., became head of the Methodist Book Concern in 1824; founded the *Methodist Quarterly Review*; and he was active in organizing several colleges, including Wesleyan and Dickinson. See *Life*, by his son, Robert Emory (1844).

Emory College. A Methodist institution of learning at Atlanta, Ga., founded in 1836, and named in honor of Bishop John Emory of Maryland. It comprises preparatory, college and law departments and a summer school, and in addition offers special courses, not leading to a degree. The college confers the bachelor's and master's degrees, but gives no honorary degrees or degrees for work *in absentia*. In 1941 it had 1,500 students, 132 instructors, a large and excellent library, and a substantial endowment.

Emotions. Mentally, emotions are characterized by a certain quality or feeling-tone (pleasure, pain, indifference), degree (intensity, quantity), speciality (points of specific distinction where quality and degree are practically the same). As the lower or sensuous special feelings are named sensations, so the higher or ideal special feelings are named emotions, which are the feeling aspects of the perceptive processes (Baldwin). Accordingly, Baldwin groups the 'special ideal feelings' (or emotions) into emotions of activity, which include emotions of adjustment and of function; emotions of content, which include presenta-

tive emotions and relational emotions. Presentative emotions, again, include emotions of self and objective emotions, the latter being divided into expressive and sympathetic. Relational emotions include the logical and the conceptual, the latter including the ethical, religious, and aesthetic emotions. Physically, the emotions are characterized by diffused nervous excitement, issuing in muscular and visceral effects. Disorders of digestion, respiration, etc., disturb the feeling-tone of the emotions. This is confirmed by the facts in morbid cases. In melancholia, for example, disturbed nutrition is among the first signs of the disease.

See Bain's *Emotions and Will* (3d ed. 1899) for analysis and general exposition, physical basis, etc.; Baldwin's *Handbook of Psychology—Feelings and Will* (1891), for general exposition and discussion of main issues; James's *Principles of Psychology* (1890), theory of emotion; Stout's *Manual of Psychology* (1899), bk. iii. ch. iv., critical exposition.

Empedocles, ancient Greek philosopher, flourished about 450 B.C., and was a native of Agrigento in Sicily. He is best known for his theory of the 'four elements'—earth, air, water, and fire, out of which the whole world has come into being, under the action of the forces of love and hate—i.e., attraction and repulsion. See the *Fragmenta* of his writings, ed. by Stein (1852); and further, Baltzer's *Empedocles* (1879), and Ueberweg's *History of Philosophy*, i., trans. (1872).

Emperor, Title of. The union of Pope and Emperor was embodied in the theory of the Holy Roman Empire, which was considered to perpetuate the ancient Roman empire, and lived on till 1806. The Emperor and Pope, according to this theory, were set above all other potentates. The term emperor was in the 18th century applied to the rulers of Russia, after 1806 to Francis of Austria, and in 1871 to William of Prussia, in each case signifying the supremacy over a wide extent of territory, containing probably men of many nationalities. The adoption (1876) by Queen Victoria of the title of empress was similarly a recognition of her dominion over various Indian peoples.

Emperor Butterfly, Purple Emperor, or Emperor of Morocco (*Apatura iris*), a very handsome southern European butterfly, remarkable for its affection for putrid meat, by means of which it is readily trapped. The expanded wings measure three inches across, and in the male are of a shining purple color, with spots and bars of white.

Emperor Moth (*Saturnia carpin*), a handsome European moth, remarkable for the eyespot present on both wings in both sexes.

Emphysema, a medical term for the peculiar condition of cellular tissues into which air has escaped. It is common in lung tissue which has lost elasticity by continued over-expansion, as in asthma and bronchitis, and in some cases by continued practice on wind instruments. If the emphysema be well marked, the chest wall over the part involved does not rise and fall during respiration, while the breath sounds, as heard through the stethoscope, are altered, and percussion yields a different note.

Surgical Emphysema is the term used for emphysema following such injuries as a wound of the lung by a broken rib.

Emphyteusis in Roman law was a contract by which an interest in land was created, amounting to a lease in perpetuity or for a long term of years. Emphyteusis closely resembles the agreement by which a feudal estate is created. See FEUDALISM.

Empire, a term derived from the Latin *imperium*, denoting a state of considerable size, and generally of a composite character, whose sovereign, as a rule, bears the title of emperor. Though preceded by the short-lived empire of Alexander, the Roman Empire was practically the first, as it was unquestionably the greatest empire of antiquity.

See EMPEROR; ROME; HOLY ROMAN EMPIRE; BYZANTINE EMPIRE; BRITISH EMPIRE.

Empire State is a popular name for New York State, due to its great population, wealth, and commercial supremacy.

Empire State Building, the tallest building in the world, is situated on Fifth Ave., New York City. It is built in the form of a vast tower and reaches a height of 1,248 ft. The main structure is surmounted by a 'mooring mast' containing observatories and with a beacon on top. It was completed in 1931.

Empiricism, a school in philosophy which admits of nothing as true but what is the result of experience, rejecting all *a priori* knowledge. It arose out of the system of Heraclitus. The founder of modern empiricism was Locke, who makes experience the basis of all knowledge, comprehending alike sensation and reflection.

The term *Empirical Laws* is applied to such as express relationships, which may be merely accidental, observed to subsist among phenomena, but which do not suggest or imply the explanation or cause of the production of the phenomena. See SENSATIONALISM; EXPERIENCE.

Employers' Associations are organizations of employers of labor whose chief function is to unify the conduct of employers toward employees. In the United States, they are of two kinds: those organized for the purpose of opposing labor organizations, and those organized for the purpose of bargaining with labor organizations. Associations may be composed either of employers in the same industry or of those in any industry.

Employers' Liability and Workmen's Compensation. In the states of the civilized world there are two systems of employers' liability for accidental injuries. The first, which formerly prevailed in the United States, is that of *fault*—i.e., an employee injured in the course of his employment can recover damages only where the jury finds that the employer was negligent, and that negligence caused the accident. The second is that of *compensation*, which compels the employer to indemnify his workmen for every injury not caused by wilful negligence of the victim himself, and embraces both simple compensation and also its more complex form of compulsory insurance.

Over thirty years ago, England passed its first workmen's compensation act, providing for the payment of damages by employers in hazardous occupations for all accidents, regardless of negligence; and over forty years ago the Germans discarded the principle of negligence, and adopted a system providing for general indemnity practically without regard to the fault of either employer or employee. It was not until 1908, that the first workmen's compensation law appeared on the statute books of an American state but since that time such laws have been adopted by the majority of the states. In most states insurance of the employers' liability to pay compensation is an essential feature of the workmen's compensation system.

In 1912 and 1913 the New York state legislature provided, by resolution, for an amendment to the constitution allowing the passage of a compulsory compensation act. The amendment was ratified by the voters at the election in November, 1913, and on Dec. 12, 1913, at a special session upon an urgency message from Governor Glynn, the legislature passed a workmen's compensation law which is not only much more liberal in its provisions than that of 1910, but is the most advanced of any in America.

This law is practically compulsory, and requires employers to insure against accidents to their employees in either of four ways—self-insurance (upon approval of State commission

as to security), mutual insurance, private company insurance, or State fund insurance. There are two striking constructive features of this act. *First*, for insurance purposes the division of employers into great trade groups is permitted, which provision authorizes building contractors, for example, to form an association for the purpose of making plans to prevent accidents, elect officers, study conditions and rates, and work in co-operation with the State commission. The *second* and more striking feature of the New York act is the requirement that all claims for compensation must be passed upon by the State Insurance Commission acting through its individual members or through deputies, and that all payments to the beneficiary must be made by it.

Other noteworthy features of the New York act are that it grants life-long compensation for permanent disability; grants compensation of 66 2-3 per cent. of wages, while none of the other States grants more than 50 per cent.; grants to widows compensation for the entire period of widowhood; and grants compensation to surviving children until they reach the age of 18 years, which is two years more than is granted by any other State or by any other country except Italy. There are some features however, in which the act does not equal the standards set by mature European experience.

Franklin D. Roosevelt, while Governor of New York, appointed a commission to review medical and hospital problems in connection with workmen's compensation. This inquiry bore fruit in 1935 when Governor Herbert H. Lehman approved laws providing occupational insurance and ending alleged medical abuses, including free-splitting. The injured employee was given the right to choose his own physician and workers contracting diseases incident to their occupations were protected. In 1941, the New York Department of Labor made compensation awards in 84,799 cases arising from industrial accidents. The payments totalled \$31,563,584, exclusive of medical and administrative costs.

See ACCIDENTS, INDUSTRIAL; INSURANCE, INDUSTRIAL; PENSIONS, *Industrial Pensions*; SAFETY, INDUSTRIAL.

Employment Bureaus. See Unemployment.

Emporia, city, Kansas, county seat of Lyon co., on the Neosho River. It is the seat of the College of Emporia, State Normal School, and the Western Musical Conservatory; p. 13, 188.

Empress of Ireland, liner of the Canadian Pacific Railroad Company, sunk as a result of a

collision with the collier *Storstad* in the St. Lawrence River, May 29, 1914, with a loss of 1,024 lives. The collier was held responsible for the disaster.

Empyema, a collection of pus in the space between the pleura covering the surface of the lung and that lining the chest cavity. The term is sometimes loosely used for any similar inflammatory condition. See PLEURISY.

Empyrean, a word used by the old metaphysical natural philosophers to designate the highest region of light, where the purest and most rarefied elements of fire existed.

Empyreuma (Greek *empyreio*, 'I kindle'), the burned smell and acrid taste which result when vegetable or animal substances are decomposed by a strong heat. The cause of the smell and taste resides in an oil called *empyreumatic*.

Ems, or Bad Ems, a bathing place with warm mineral springs known to the Romans, and celebrated in Germany as early as the twelfth century. It is situated on the River Lahn, 10 m. s.e. of Koblenz. From Ems Bismarck issued the notorious Ems telegram (see FRANCO-GERMAN WAR), July, 1870.

Ems River, Germany, rises in the Teutoburger Forest, and flows north and west across the west end of the great North German plain, and issues into the Dollart, and so to the North Sea. Total length, about 200 m. Its usefulness was greatly increased by the construction of the Dortmund-Weser-Ems Canal.

Emulsin, or **Synaptase**, is an enzyme, or unorganized ferment, occurring in almonds. It has the power of converting the gluco-side amygdalin, present in bitter almonds, into glucose, prussic acid, and benzaldehyde. See ALMONDS, OIL OF.

Emulsion is the term applied to those preparations in pharmacy in which oleaginous substances are suspended in water by means of gum, sugar, carrageen, yolk of egg, etc.

Enamel, the name given to vitrified substances applied chiefly to the surface of metals. Enamelling is practiced for purposes of utility; and for producing artistic designs, and for ornamental purposes generally. The basis of all enamels is an easily fusible, colorless glass, to which the desired color and opacity are imparted by mixtures of metallic oxides. The mass, after being fused together and cooled, is reduced to a fine powder, washed, and applied to the surfaces to be covered. The whole is then exposed in a furnace till the enamel is melted, when it adheres firmly to the metal.

The art of enamelling has been practiced for

many centuries in India, China, and Japan, France, Germany, and Italy, England and Ireland. During the Renaissance the art revived in Italy, and in France the artists of Limoges produced many priceless works. Recent years have witnessed a great revival in Great Britain and France.

Distinguished with reference to the manner of execution, enamel work may be divided into four main classes: (1) *Cloisonné*, or enclosed, the method of the Byzantine school, in which the design in formed in a kind of metal case, and the several colors are separated by very delicate filigree gold bands. *Plique à jour* is similar (less the metal background), the effect resembling on a small scale a stained-glass window, the leads being reproduced by the wires of *plique à jour*. (2) *Champlevé*. In this process the ornamental design was cut in the metal, generally copper, to some depth; and wherever two colors met, a thin partition of the metal was left to prevent the colors running into each other by fusion when fired. (3) Translucent enamel, or *Bassetaille*, much used in later mediæval times, is a development of *champlevé*. The subject is carved in relief below the upper surface of the metal. (4) Surface-painted enamels may be divided into two stages. In the first the practice was to cover the metal plate with a coating of dark enamel for shadows, and to paint on this with white. This style soon degenerated, and gave place to the *miniature* style, in which the plate is covered with a white opaque enamel, and the colors are laid on this with a hair pencil, and fixed by firing. The greater part of the artistic enamel work of the present day is of Japanese fabrication, and consists of *cloisonné* work on a copper basis.

Since the beginning of the nineteenth century many attempts have been made to cover iron with a vitreous surface, and several patents have been taken for such methods of enamelling. In recent years these processes have been greatly improved and enameled utensils are now produced in all colors and with much greater wearing qualities than formerly. For enamelled earthenware, see POTTERY; PORCELAIN.

Consult Paul Randau's *Enamels and Enamelling*; Dalpayrat's *Limoges Enamels*; Bowes' *Japanese Enamels*; Henry Cunynghame's *Art Enamelling upon Metals*; Day's *Enamelling*.

Enamel of teeth is the very hard, translucent white layer covering the working surface of the dentine or ivory of the teeth of most mammals. See TEETH.

Enarea, hilly region, Abyssinia, s.w. of Shoa. The capital is Saka or Sakka, 150 m. s.w. of Adis Abeba; p. 40,000.

Enare Lake (also spelt *Inara*, *Enari*, *Indiagher*), large fresh-water basin of Russian Lapland, at the northern extremity of the province of Uleaborg, with an area of 600 sq. m.

Encalada, Manuel Blanco (1790-1876), was born in Buenos Ayres, and joined the Chilean revolutionary party. In 1825 he was head of the army of Chile. He was for two months president of the republic in 1826; governor of Valparaiso in 1847-52; and minister to France in 1853-58.

Encaustic, a term used to describe a picture painted by means of heated wax. The term encaustic is also used in the art of making tiles, plain or decorated, for pavements of buildings. See MURAL DECORATION; TILE.

Enceinte (French), in fortification, denotes generally the whole area of a fortified place. See FORTIFICATION.

Encephalitis, sleeping sickness (African trypanosomiasis), is an endemic tropical African disease caused by the bite of a species of tse-tse fly. It is characterized by mental deterioration, drowsiness or profound sleep, ending in emaciation and death. Another form of the disease, encephalitis lethargica, has been sporadically epidemic at several points in the United States, a severe outbreak occurring in the St. Louis area in 1933. In several cases of so called sleeping sickness, patients have lived in a stupor for more than a year.

Encephalocoele, a tumor of the head which bulges through a suture of the skull. It is a protrusion of brain substance covered by the normal brain membranes and by the skin. It is congenital.

Encephaloid, Medullary, or Soft Cancer, is of the glandular tissue type, and derives its name from its brainlike consistency. Its growth is more rapid than that of scirrhus, and it is more frequently abdominal.

Enchantment. See INCANTATION; MAGIC.

Enchondroma, a cartilaginous tumor, most often found on the bones of fingers, toes, and legs, though sometimes in the parotid gland and elsewhere. A pure enchondroma is not malignant; but as it may assume a malignant character, it should be excised.

Encina, or Enzina, Juan de la (c. 1469-1534), the founder of the secular drama in Spain, was born near Salamanca.

Encke, Johann Franz (1791-1865), German astronomer, was born at Hamburg. While at Gotha, the astronomical prize offered by

Cotta was awarded to Encke for his determination of the orbit of the comet of 1680. This led him to solve the distance of the sun. In 1819 he proved that the comet discovered by Pons, Nov. 26, 1818, revolves in the period of about 1,200 days, and had been already observed in 1786, 1795, and 1805. It has since gone by the name of Encke's Comet, and has appeared regularly; the period of its recurrence being 3.29 years, or about 3 3-10 years (see COMET). Consult Bruhns' *Life*.

Encore ('again'), a French expression, generally used by English audiences when they are requesting the repetition of the performance of a piece of music, etc. It is not used by the French themselves, who, in similar circumstances, employ the word *bis* ('twice').

Encratites, a name given in the second century to Christian ascetics who abjured marriage and the use of flesh and wine.

Encyclical (*literæ encyclicæ*), a letter on great questions addressed by the pope to all his bishops. It differs from a bull mainly in that the latter is usually more special in its destination. The famous encyclical, *Quanta Cura*, issued Dec. 8, 1864, by Pius IX., was accompanied by a *Syllabus* condemning specifically eighty errors in religion, philosophy, and politics.

Encyclopædia (from the Greek *enkyklios*, 'circular' or 'general,' and *paideia*, 'discipline' or 'instruction') is in modern usage a work professing to give information in regard to the whole circle of human knowledge, or in regard to everything included within some particular scientific or conventional division of it. As knowledge has increased it has become necessary, in order to say something about everything, not to say everything about anything. The great Latin collections of Terentius Varro, dating from 30 B.C., and the so-called *Historia Naturalis* of the elder Pliny (23-79 A.D.), may be considered as the first specimens of their class. Under the calif of Bagdad, Alfarabi or Farabi, in the tenth century, wrote a remarkably complete encyclopædic work which exists in a ms. in the Escorial. Vincent of Beauvais, who probably died in 1264, gathered together, under the patronage of Louis IX. of France, the knowledge of the Middle Ages in three comprehensive works—*Speculum Historiale*, *Speculum Naturale*, and *Speculum Doctrinale*—to which an unknown hand soon after added a *Speculum Morale*. The *De proprietatibus rerum* of Bartholomeus de Glanville (1240) deserves mention as being of English origin and highly successful in the translation (1398) by the Cornishman John Trevisa.

Among the numerous encyclopædias of the seventeenth century it is enough to mention Moreri's *Grand Dictionnaire historique* (Lyons, 1674), which reached a 20th edition in 1759; Hofmann's *Lexicon Universale* (2 vols., folio, Basel, 1677; 4 vols., folio, Leyden, 1698), which was the first attempt to bring the whole body of science and art under the lexicographic form; Thomas Corneille's *Dictionnaire des Arts et des Sciences* (2 vols., Paris, 1694); and, most famous of all, Bayle's *Dictionnaire historique et critique* (4 vols., Rotterdam, 1697), which was mainly designed as corrective and supplementary to Moreri, and appeared in both a modified and an enlarged English form. It was in the course of the seventeenth century that encyclopædists began regularly to employ the vulgar tongues for their work, and to arrange their material alphabetically for convenience of consultation.

The series of great encyclopædic works in modern English practically began with the anonymous *Universal, Historical, Geographical, Chronological, and Classical Dictionary* (2 vols., 1703), and the *Lexicon Technicum* of Dr. John Harris (London, 1704). Ephraim Chambers followed in 1728 with his *Cyclopædia, or an Universal Dictionary of Arts and Sciences* (2 vols., folio), which presents a distinct advance by its use of cross references. A revised and enlarged edition of Chambers' was published in 1778-88 by Abraham Rees; and a French translation, by John Mills, formed the basis of that famous *Encyclopédie* which became in the hands of D'Alembert and Diderot the organ of the most advanced and revolutionary opinions of the time.

Between 1768 and 1771 there appeared at Edinburgh, in 3 vols. quarto, the first edition the *Encyclopædia Britannica* by 'a Society of Gentlemen in Scotland.' Colin Macfarquhar, Andrew Bell, and William Smellie share the credit of the plan. Biographical and historical articles were first introduced in the second edition. The fourteenth edition was published in 1929 and reprinted in 1932. Many notable encyclopædias had meanwhile been appearing—The *Harmsworth Encyclopædia* (1905), planned and carried out by Thomas Nelson & Sons at their Edinburgh establishment, had a far wider circulation than any previous one, half a million copies being sold at once. The American *Nelson's Encyclopædia* was issued simultaneously in the United States. A notable departure in encyclopædia making was made in 1909, when *Nelson's Perpetual Loose-Leaf Encyclopædia* and Research Bureau for Special Information was established in New York.

Other encyclopædias are *Encyclopædia Americana* (2nd ed.); *New International Encyclopædia* (2nd ed.); *Columbia Encyclopædia* (1 vol.). Among specialized encyclopædias are *Catholic Encyclopædia*; *Jewish Encyclopædia*; *Cyclopedia of American Government*; *Encyclopædia of the Social Sciences*. Excellent foreign encyclopædias are *Enciclopedia italiana* and *Enciclopedia universal ilustrada Europeo-Americana*. Encyclopædias *Britannica* and *Americana* and the New International Encyclopædia are kept up-to-date by yearly supplementary publications.

Endecott, John (c. 1588-1665), colonial governor of Massachusetts, was born in Dorchester, England, and landed as manager of the plantation of Naumkeag (Salem) in 1628. After the issue of the Massachusetts Bay charter, he gave way (1630), as executive head of the colony, to John Winthrop, though he continued to be one of the leaders of the Puritan colonists. He was deputy governor of the colony (1641-3, 1650, and 1654), and governor (1644, 1649, 1651-4, and 1655-65); and in 1658 was president of the United Colonies of New England. He represented to an extreme degree all the harshness, bigotry, and asceticism of Puritanism and was the leader of the opposition to the Quakers. See Endicott, *Memoir of John Endecott* (1847); and the 'Memoir of John Endecott' in the *Antiquarian Papers* (1879) of the American Antiquarian Society.

Endemic, a disease which prevails in a certain district, or among a certain people, either continuously or at certain regular seasons. An endemic disease may become epidemic.

Enderby Land, a desolate district in Antarctic Ocean, 67° 20' S., and 49° 47' E. It was discovered in 1599 by Dirk Gerritsz, and visited in 1881 by Captain Biscoe, an English sailor, who named it after his employers. In 1929-30 it was explored and extensively mapped by a British expedition under Sir Douglas Mawson and by a Norwegian expedition under Captain Røiser-Larsen.

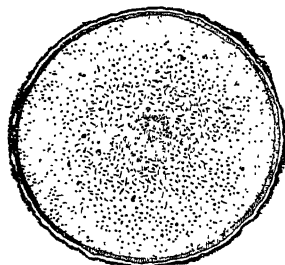
Endive. See **Chicory**.

Endocardium, the thin membrane lining the cavities of the heart, and helping to form its valves. It is liable to inflammation (endocarditis).

Endogamy is the custom of intermarrying only with those of one's own stock. Many races, however, among whom may be cited the Arabs, early discovered that endogamy, when long persisted in, impoverished the breed.

Endogens, those plants in which new wood bundles are produced within the older ones, the fibro-vascular bundles containing no cambium.

As soon, therefore, as the outer rind of the stem of such a plant has become hard, the stem cannot increase in thickness. Endogenous plants are often spoken of as monocotyledons, because their seeds have only one seed-leaf.



Stem of Endogen.

Cross section of cocoanut palm stem.

Endolymph, in anatomy, the lymph or serous fluid which lies in the membranous labyrinth, which in its turn is enclosed in the bony labyrinth or internal ear. The lymph bathes the minute endings of the auditory nerve.

Endomorph. When one mineral is enclosed within another it is said to be an endomorph, and that which surrounds it is called a perimorph. Endomorphs are usually due to the successive formation of two minerals in a confined space.

Endophagy. See **Cannibalism**.

Endor, a town of Palestine famous for Saul's visit to the witch; now the little village of Andur, on the n. slope of the hill facing towards Tabor, near the source of the Kishon.

Endorsement. See **Indorsement**.

Endymion, in ancient Greek legend a beautiful youth who spent his life in perpetual sleep.

Enema, fluid injected into the rectum or lowest portion of the bowel. The commonest use is for the relief of constipation. Enemas are also used for the introduction of food which cannot be administered by the stomach or for the administration of medicine.

Energumen, a term given to one who is understood to be 'wrought upon' by an indwelling spirit other than his own. In its milder acceptance, the word is synonymous with 'enthusiast' or 'fanatic.' But primarily it implies demoniacal possession. See Tylor's *Primitive Culture* (new ed. 1903), ii. 112-131.

Energy. A system is said to possess energy when it has the power of doing work. The en-

ergy of a system, when due in any way to motion, is termed 'kinetic' energy, or energy of motion. But we are accustomed to recognize the fact that a steam-hammer, for example, possesses energy when at rest in its highest position. Energy of this type is called 'potential' energy, or energy of position. In a vibrating pendulum the energy is constantly changing from a kinetic to a potential form, and conversely. All forms of energy are capable of classification under one or other of the types, kinetic or potential energy. The property of *transformation* is characteristic of all energy. In all its transformations, however, another characteristic is evident. This is *conservation* of energy. By it we mean that, in so far as can be tested, the amount of energy in any isolated part of the universe remains absolutely constant in amount. See **HEAT**; **WORK**.

Enesco, Georges (1881-), violinist, composer, and conductor, was born in Roumania. His works include *Poeme Roumain*, *Suite dans le style ancien*, *Symphonie concertante*, and his ambitious dramatic work *Oedipe*.

Enfantin, Barthélemy Prosper (1796-1864), French socialist, one of the founders of Saint-Simonism, was born in Paris. Enfantin and his adherents were prosecuted for proceedings injurious to public morality (1832), and the leader was sentenced to twelve months' imprisonment. Afterwards he became editor of the journal *Le Crédit Public*. See Castille's *Le Père Enfantin* (1859).

Enfield, town, Middlesex, England, 10 m. n.e. of the centre of London. Here is located Royal Small Arms Factory, which manufactures rifles, swords, and machine guns. Enfield rifles were so called because they were first made here; p. 60,743.

Engadine, the Swiss portion (canton of the Grisons) of the upper Inn valley, 59½ m. long. The Upper Engadine includes the well-known tourist resorts of Pontresina and St. Moritz; the Lower Engadine has mineral springs; p. 16,504.

'Engagement,' The. When Charles I. was a prisoner in Carisbrooke Castle, he entered into a secret engagement with Lauderdale and Hamilton, by which he undertook to allow Presbyterianism in England for three years, and to suppress the Independents, Anabaptists, and other sects. The Scots, on their part, agreed to invade England, to restore the king, and to put an end to the Parliament.

Engelmann, George (1809-84), American botanist, was born at Frankfort-on-the-Main,

Germany. His studies and collections, especially of the Cacti gave him a prominent position as an authority. His collection was placed in the Shaw botanical gardens at St. Louis.

Engels, Friedrich (1820-95), German socialist, was born in Barmen. He was joint-author with Marx of the famous communist manifesto of 1848, and took an active part in the foundation of the 'International Workingman's Association' (1864). Among his numerous works are *Die Lage des arbeitenden Klassen in England* (1845; Eng. trans.); *Der Ursprung der Familie, des Privateigentums, und des Staates* (8th ed. 1900). After Marx's death, he issued the second, third, and fourth volumes of that writer's *Das Kapital* (1885).

Engine. See **Air Engines; Gas Engines; Oil and Gasoline Engines; Steam Engines; Motor Boats; Motor Cars; Railroads; Locomotives; Fire Department.**

Engineer Corps, U. S. Army. a branch of the army established in 1802, exercising both military and non-military functions. It furnishes a regiment of combat engineer troops to each Infantry Division, as well as other combat engineer units for corps and armies, and has distinguished itself by its military record in American wars and in World Wars I and II, in which it constructed at an unprecedented rate and scale the vast base and supply system for the American Expeditionary Forces abroad. Among its peace-time military functions are topographic and hydrographic surveying; map reproduction; the design, construction, and maintenance of seacoast fortifications, etc. The non-military duties of the Corps are numerous, and it has played an important part in the development of the country through surveying, road work, waterway improvement, lighthouse construction, meteorological work, etc. See **ARMY OF THE U. S.; ENGINEERING, MILITARY.**

Engineer Corps, U. S. Navy, was formerly in charge of designing and operating the machinery equipment of naval vessels. The first appointment of a marine engineer in the U. S. Navy was made in 1836. The Engineer Corps was established in 1842, but was abolished as a distinct body by the personnel bill of 1899, which made engineering service part of the line of duty of all naval officers—a step which had in view the more harmonious development of the naval organization, recognizing the fact that naval efficiency depends largely on engineering appliances and skill.

Engineering, strictly the science or art of constructing or employing engines and mach-

ines or of executing public or other works demanding a knowledge of machines and the principles of mechanics; more generally the application of scientific methods to industry in any of its branches.

Originally two great branches of engineering were recognized—Civil Engineering and Military Engineering—but with the multiplication of machinery and increasing specialization in industry, the field has been divided and subdivided, according as emphasis has been placed on one phase or another, as, for example, electrical problems, the automotive industries, sanitation, or hydraulics.

Engineering, Automotive. See **Aeronautics; Electric Traction; Motor Boats; Motor Cars; Railroads.**

Engineering, Chemical. See **Chemistry; Chemical Engineering.** *Industrial Chemistry.*

Engineering, Civil, a term originally used to embrace all engineering practice that was not included under the head of military engineering, but now restricted to the planning and constructing of fixed structures of utilitarian character, in distinction from moving structures or machines, the province of the mechanical engineer, and of structures primarily ornamental, the field of the architect. Its chief applications or fields of activity are: securing the land against natural forces, by retaining walls, drainage ditches, flood protection work, sea walls, breakwaters, shore revetments, pavements, etc.; making ways of communication, by roads, railways, canals, and dredged channels, lighthouses, tunnels, and bridges; water supply to towns, by wells, dams, reservoirs, aqueducts, pipe networks, filters, etc.; drainage and refuse disposal for towns, by sewage-pipe systems, sewage filters and purifying tanks, garbage furnaces and digesters, etc.; and constructing buildings, platforms, docks, and wharves. It includes, also, the measurement of land by surveying, which is required in nearly every civil engineering undertaking.

With the development of the steam engine in the early nineteenth century, a demand arose for engineers specially trained in the design and construction of machines, and this gradually led to the growth of a distinct professional field called mechanical engineering. See **ENGINEERING, MECHANICAL.** Mining practice also came to require the application of scientific knowledge and experience, and later, the utilization of electrical science developed still another special school of engineering.

Engineering, Electrical, that branch of engineering which has as its basic idea the con-

troi of electrical energy for human service with the highest efficiency compatible with economical investment. It may be divided according to the class of service involved—as telephony, telegraphy, electro-chemistry, electric railroading, power generation and transmission, industrial applications, lighting, etc. See ELECTRICAL MACHINERY; ELECTRICAL SUPPLY; ELECTRIC BELLS AND ALARMS; ELECTRIC CABLES; ELECTRIC CIRCUIT; ELECTRIC LAMPS; ELECTRIC LIGHTING; ELECTRIC POWER TRANSMISSION; ELECTRIC TRACTION; TELEGRAPHY; TELEPHONY; WIRELESS TELEGRAPHY; WIRELESS TELEPHONY.

Engineering, Experimental, that branch of engineering which covers the theoretical investigation of the problems arising in the practice of the engineer. Most of this experimental work is done in laboratories connected with the larger technical schools or industrial plants. The Sibley College of Mechanical Engineering at Cornell University was the first (1885) to make Experimental Engineering a part of the undergraduate course.

Engineering, Hydraulic. See **Hydraulic Machinery**.

Engineering, Marine, that branch of engineering which is concerned with the design and construction of engines for propelling ships. See SHIPBUILDING; OIL AND GASOLINE ENGINES; STEAM ENGINES; TURBINES; STEAM.

Engineering, Mechanical, that branch of engineering which is concerned with the design, construction, operation, and study of machines. As a science or professional activity it had its origin with the steam engine. The scope of mechanical engineering has widened tremendously, but the steam engine (including the steam turbine), the steam boiler, and auxiliary appliances of power production, still form the central group of the mechanical engineering field.

The appliances with which the mechanical engineer deals may be grouped as—prime movers, transmission machinery, and power-utilizing machines. The sciences of mechanical engineering are: applied mechanics, the study of materials and their testing, of mechanisms, of the metal-working arts, thermodynamics, and the study of heat production from fuels and heat transmission. See SCHOOLS OF ENGINEERING.

Engineering, Military, is the adaptation of engineering to the conditions imposed by a military situation, in conformity with the principles of the military art. Certain special services, such as the Signal Corps, Ordnance Department, and Air Service, while involving the

application of scientific principles and technical skill, are not activities in the field of military engineering. Military engineers in war fulfill the following functions: Front line engineer and combat operations of all kinds; the procurement, storage, distribution and maintenance of engineer equipment and material, the construction and maintenance of all structures, except those recognized as being the work of the Signal Corps; the operation of mobile and semi-permanent shops and factories; the establishment and maintenance of electric light, water, and sewer systems; the conduct of topographical and surveying operations, together with printing and map reproduction; the construction of narrow and standard gauge railroads together with their operation and maintenance; the design, procurement, development, technical and tactical operation of searchlights in mobile defence and defence in the zone of the armies against enemy aircraft and night bombing activities; the design, fabrication, and operation of sound and flash ranging devices; the manufacture, development, and use of camouflage; and the production of forest products for military use. The Chemical Warfare Service (see CHEMISTRY), though operated independently during the Great War, was initiated by the engineers of the army, and is not an improper activity, and development task, of military engineering.

See FORTIFICATION; COAST DEFENCE; ROADS; RAILWAYS. *Military Railways*; BRIDGES; TRENCH; CAMOUFLAGE; ENGINEER CORPS, U. S. ARMY.

England and Wales, the southern, largest, and most populous portion of Great Britain, is irregularly triangular in shape, and is bounded on the n. by Scotland and the North Sea, on the e. by the North Sea, on the s. by the English Channel, and on the west by St. George's Channel and the Irish Sea. It has a coast line of 1,800 m., deeply and frequently indented by bays and estuaries. There are many islands or groups of islands in the surrounding waters, notably the Channel Islands, Isle of Man, Isle of Wight, Anglesey, and the Scilly Islands. The total area of England and Wales is 58,324 sq. m. In general, it may be said that the west of England, including Wales, is mountainous, while the east is a series of plains crossed by low hills. The western region falls into four fairly well-defined physical divisions—the picturesque Lake District in the north, occupying the counties of Cumberland, Westmoreland, and North Lancashire; the Pennine Range running southward from the Scottish border to Central England; Wales, with which may be

included the counties of Shropshire, and Hereford; and the peninsula of Cornwall and Devon. Scafell Pike, the highest point in England, in the Cumbrians, reaches 3,200 ft., while Snowdon, the loftiest peak in Wales, attains 3,500 feet. East of the Cambrian range are the Clee Hills of Shropshire and the Malvern Hills following the eastern boundary of Hereford. Farther south are the Cotswold Hills of Gloucester, the Mendip Hills of Somerset, the Blackdown Hills of Somerset and Devon, the heights of Dartmoor and Exmoor and the Cornish Heights.

In Eastern England escarpments of the relatively harder underlying rocks form the Wolds of Yorkshire and Lincoln, and rise into a low range of hills that extend from Norfolk to Wiltshire, the more prominent portions of which are known as the Chiltern Hills, the Marlborough Downs, and Salisbury Plain. The principal rivers are the Thames (209 miles), Great Ouse (160 m.), Mersey (70 m.) and Tyne (80 m.).

The climate is equable, deriving its character from the country's insular situation. The winters are milder and the summers cooler than at other places within the same parallels of latitude, and there is great humidity. The geology of England is of peculiar importance. The fossiliferous strata having been first systematically studied and expounded here. British geologists have given to the world the names whereby most of the larger divisions and subdivisions of these strata are known. Nearly all of the recognized 'systems' occur in Britain. Indeed, the only system not found in Britain is the Miocene—the beds formerly classed as of this age being now included in the Oligocene. Nearly all the formations yield minerals of economic value, of which coal and iron are by far the most important. It is the largest coal exporting country in the world and its abundant fuel supply has been a great factor in its immense manufacturing development.

In agriculture England has been reckoned a backward country, but this is due rather to the higher relative advantages which it possesses for the prosecution of manufacture, as compared with other countries, than to positive unsuitability for agricultural development. Cattle and sheep raising and dairying are carried on in the central and southern parts of England. Devonshire is famous for its butter and cream, and the South Downs for mutton.

Her insular position, numerous large ports, the nearness of all her cities to the sea, and her abundant supply of coal and iron have united to make England one of the great workshops of

the world. Up to the latter part of the 18th century large quantities of raw material were exported, manufacturing was not carried on to any great extent, and the industrial centres were confined to the southern and eastern parts. With the development of the coal industry, however, and the resultant use of machinery and steam-power, manufacturing increased enormously and the northern towns in whose vicinity much of the coal is found, far outstripped their southern neighbors. Great manufacturing cities have grown up on the coal fields; hardware is made in the iron districts, and chemical industries are carried on near the salt deposits. Cotton is made in Lancashire; wool in West Riding; potteries are found in Staffordshire; metal industries in Middlesbrough, South Durham, South Wales, and South Staffordshire; shipbuilding is done on the Tyne; Sheffield is famous for cutlery and Swansea for tin plate. The textile industry may be said to be the most important.

The position England occupies between North America and Northwest Europe and close to the chief line of traffic between this latter district and Australia, India, South and West Africa, guarantees her a large share in the world's traffic. For external communication the facilities are abundant. Not only is the coast line long, but it is marked by numerous and easily accessible harbors, some purely natural, and some improved by artificial harbor works. The leading ports are London, which, with the possible exception of New York City, is the greatest trade centre of the world, Liverpool, Cardiff, Hull, Newcastle, Bristol, Dover, Harwich, and Southampton.

England is densely populated, with nearly 68½ inhabitants to the square mile. The civil population of England and Wales is 39,947,931 about 80 per cent. of whom live in the towns and urban districts. The principal cities are Greater London with 8,655,000 inhabitants; Birmingham, 1,029,700; Liverpool, 836,300; Manchester, 736,500; Sheffield, 518,200; Bristol, 415,100; Hull, 319,400; Bradford, 289,510; Newcastle-on-Tyne, 290,400; Stoke-on-Trent, 272,800; and Nottingham, 278,800. Emigration has been of considerable assistance as a means of reducing the excess population of the country.

The Established Church of England is Protestant Episcopal, but civil disabilities on account of religion do not attach to any class of British subjects. In May, 1914, after a number of years of agitation an act disestablishing the church in Wales was passed, and the actual disestablishment, postponed because of the

World War, took place March 31, 1920. (See **DISESTABLISHMENT**).

Higher education is provided for by the Universities at Oxford with 22 colleges and 3 private halls; Cambridge with 17 colleges and 1 hall; Durham; London; Victoria at Manchester; Birmingham; Leeds; Liverpool; Reading; Sheffield; Bristol; and the University of Wales. At most of the Universities women are admitted on equal terms with men, but there are several colleges exclusively for women. Women were first admitted to Oxford University in 1920.

See EDUCATIONAL SYSTEMS, NATIONAL.

The British standing army dates from 1645. When the Army of the Commonwealth was disbanded on the restoration of Charles II., the Duke of York, afterwards James II., requested permission to retain the services of General Monk's Troop of Horse and Regiment of Foot as a protection against rioting. The request was granted, and this regiment became the famous Coldstream Guards. Other regiments were soon added, as the Life Guards, the Horse Guards and the Grenadier Guards, and the standing army thus established has continued to the present day.

In 1907 the organization was completely remodelled. From that time up to the period of the World War, the military forces consisted of the Regular Army and the Territorial Army with voluntary service. The army is administered by an Army Council consisting of the Secretary of State for War and other high officials.

The British Navy is a permanent establishment administered by the Board of Admiralty, whose duties are of two classes, operation and maintenance. The navy in 1942, included in commission, 16 capital ships; 63 cruisers; 8 aircraft carriers; 210 destroyers; 46 submarines; and numerous lesser craft. The personnel was about 200,000 officers and men. Under construction or authorized were 9 capital ships; 23 cruisers; 6 aircraft carriers; and many ships of other classes. During 1912 the naval wing of the Royal Flying Corps was founded, and in 1918 an Air Ministry was formed. In April, 1918, the military and naval wings were united to form the Royal Air Force.

The supreme legislative power is vested in Parliament, consisting of the House of Lords and the House of Commons. The total number of peers entitled to sit in the House of Lords in 1938, was 783. In 1918 the franchise was revised and extended, about two million male voters and six million women being en-

franchised and seats in the House of Commons being redistributed on the basis of one to every 70,000 population. An Act of 1928 extended the women's franchise to all those over 21, adding 1,500,000 new voters. Parliament is summoned by writ of the sovereign issued out of chancery by advice of the Privy Council. The annual session usually extends from October until July. Dissolution of Parliament may occur by will of the sovereign, by proclamation, or by lapse of time, five years. The executive power is vested nominally in the Crown, but practically is exercised by the Cabinet of 20 members, whose tenure depends on the House of Commons. (See **CABINET**.)

The Crown is represented in each county by a Lord Lieutenant. A sheriff represents the executive of the Crown. England and Wales are divided into 62 administrative counties. In the great towns a municipal corporation, deriving its authority from the Crown, administers affairs. (See **CITY**.)

History.—With the departure of the Romans, English history may be said to have begun. About the year 449 the English tribes—divided into Saxons, Angles, and Jutes—began to arrive, and, till the battle of Chester in 613, struggled against the Britons, gradually driving them more and more westward. The Saxon victory of Deorham in 577 secured for the victors access to the Bristol Channel, and the Welsh of what is now known as Wales were cut off from their compatriots in Somerset, Devon, and Cornwall. In 613, Cheshire and most of Lancashire were conquered. With this, the main work of conquest was over, and the English entered upon the second period of their history. That period is known as the Struggle for Supremacy, and extended from 613 to 829. At the beginning of the seventh century England comprised the three divisions of Northumbria, Mercia, and Wessex. Kent had been the first to become civilized, but Kent was small, whereas Northumbria was a large kingdom and from 613 to 685 Northumbria, in spite of many vicissitudes, remained supreme. Christianity spread over England, and its success was largely due to the efforts of the Scotch-Irish monks who came with Oswalk to Northumbria. In the next century Mercia, under Ethelbald and Offa, became prominent. They had had no taste for political organization, and Egbert of Wessex, having overthrown the Mercians in 825, and having received the submission of the Northumbrians in 829, secured a position of supremacy.

The history of England from 829 to 1066 is the history of the establishment of the suprem-

the work of government, and with the tacit consent of the nation Edward was finally deposed for incompetence.

Edward III. was a very different man from his father, and his long reign (1327-77) saw a marked advance in the constitutional position of Parliament and in the commercial position of England. Caused by the determination of the French king to expel the English from Aquitaine, the French war was taken up by the nation, was marked by land victories—e.g. Cressy and Poitiers—and by sea victories, and was accompanied by an expansion in the trade of the country. The middle class were enriched, and simultaneously Chaucer and Langland began to write in English, and Wycliffe headed a movement against the worldliness of the church. In the land system the Black Death (1348-50) effected an equally conspicuous revolution, which brought about the employment of modern instead of mediæval methods of land management. The Treaty of Bretigny (1360) marks the highwater mark of Edward III.'s reign. After that event trouble came upon him abroad and at home. An able French king, Charles V., renewed the war, and the Black Prince alienated the people of Aquitaine. The English grew weary of the war, and their discontent, political and religious, was revealed in the Good Parliament of 1376. On his death Edward left to his successor, Richard II. (1377-99), a series of difficult tasks.

Till 1389, owing to Richard's youth, the nobles were in power, and the principal event of the period was Wat Tyler's rebellion. Its causes were political, social, and religious, and its results were beneficial to the villeins. Till 1397 the country was quiet, but in 1399 Richard was deposed on a direct constitutional issue. Henry IV. came to the throne as the representative of the 'possessioned' classes, and the Lancastrian period saw 'the trial and failure of a great constitutional experiment'; for although in Henry IV.'s reign (1399-1413) Parliament secured privileges which seemed immense, in reality, so long as the nobles continued to be the most powerful class in the country and bent on the pursuit of private war, Parliament was unable to maintain them. His son Henry V. (1413-22), at once renewed the Hundred Years' War with France. His victory at Agincourt (1410) revealed the divisions existing in France, and he had little difficulty in forcing the French government to make the treaty of Troyes (1420), which was intended to render Henry VI. king of France as well as of England. But the long minority of Henry VI. (1422-61), the quarrels of his uncles, the defection of the

Duke of Burgundy whose alliance was absolutely essential to English success, and the growth of a strong national sentiment in France, of which the career of Joan of Arc was a fitting expression, led to the inevitable failure of England in France. In 1453, with the exception of Calais, all the English possessions abroad were lost.

The inability of Henry VI. to carry on the foreign war successfully, coupled with the continued existence of anarchy in the counties, resulted in the outbreak of the Wars of the Roses. The house of Lancaster, indeed, fell from want of governance, but the accession of Edward IV. (1461-83) proved a constitutional disappointment. His death was followed by the murder of Edward V. and his brother at the hands of their uncle, who became Richard III. (1483-5). Though his administration was good, the country rejoiced at his overthrow at the battle of Bosworth (1485), followed by the accession of Henry VII. (1485-1509).

By setting up a new court (1487), known later as the Court of Star Chamber, by putting down the rebellions of Simnel and Warbeck, and by the treaty of Etaples (1492), Henry carried out the wishes of his subjects. The marriage of his daughter with the king of Scotland testified to Henry's foresight, and led to the union of England and Scotland; while the marriage of Catherine of Aragon first with Prince Arthur and, on his death, with Prince Henry, illustrated England's new position in Europe.

Henry VIII. (1509-47) and Wolsey initiated a vigorous foreign policy which for a time made England 'the arbiter of Europe.' The discovery of America was beginning to affect men's ideas, and to stir up that spirit of enterprise which led to the foundation of Greater Britain. Henry VIII. in many respects represented the ideas of his age, and when he effected the separation from Rome he was acting in consonance with the national dislike of subservience to any foreign power. At the end of his reign Henry had placed the king's authority on a firm basis, and had adopted a strong position with regard to the religious question. During Edward VI.'s reign (1547-53) this strong position was forsaken. Moreover, the wise 'waiting' policy of Henry VIII. toward Scotland gave place to aggressive measures, which culminated in the battle of Pinkie, the flight of Mary Stuart to France, and the renewal of the close alliance between France and Scotland.

The accession of Queen Mary (1553-8) was popular, for the nation resented the attempt of Northumberland to place the crown on the

head of Lady Jane Grey; and, moreover, it was resolved 'to submit no longer to a handful of religious theorists' who represented an unprincipled government. Wyatt's rebellion illustrated the dislike felt at Mary's marriage with Philip II. The loss of Calais was a fitting conclusion for a reign which was becoming insupportable to the mass of the nation.

Elizabeth, the last of the Tudors, succeeded in 1558, and reigned till 1603. 'A child of the Italian Renaissance,' she found herself compelled to adopt a *via media* between the Catholics and the Calvinists. The return of Mary queen of Scots to Scotland in 1563 proved a new danger, for Mary was a claimant of the English throne. Fortunately for Elizabeth, Mary threw her chances away, alienated her subjects, and in 1568 fled to England. A French alliance in 1572 strengthened the English queen, who could always rely upon the strong Protestant feeling of her parliaments, and upon the skilful and watchful administration of Cecil, who is better known as Lord Burleigh. In 1588 Philip II. was at last ready, and the Spanish Armada was launched against England. Its defeat opened a new period in Elizabeth's reign, and till her death she was free from all danger of a foreign attack. The great queen's reign is remarkable for an extraordinary outburst of energy in all departments of politics, commerce, religion, and literature. England was united, and the Spanish War proved to be the birth of English commerce, and led to numberless expeditions by Elizabethan seamen. The discoveries of Drake, Frobisher, Gilbert, Hawkins, and Raleigh stirred the popular imagination; while Shakespeare, Spenser, Hooker, Bacon, and many others made Elizabethan literature famous. Ireland was for the first time conquered, and the way was prepared for the colonial expansion of England in the next century.

The reign of James I. (1603-25) was the beginning of the struggle between the royal power and Parliament, which ended in the great rebellion. His intolerance in religion caused an emigration of Puritans. (See UNITED STATES.) The outbreak of the Thirty Years' War in 1618 brought new problems. James's treatment of the Palatinate question was unfortunate, and his quarrel with the Parliament of 1620-21 was the greatest blunder of his reign.

Charles I. (1625-49) was a man little calculated to inspire confidence. For eleven years Charles ruled without a parliament, and during that period the courts of Star Chamber and Ecclesiastical Commission became oppressive and unpopular. Coincident with the adoption

of repressive measures against those who opposed the king's and Strafford's civil policy were attempts on the part of Laud to enforce conformity in England, and to compel the Scots to adopt the English Prayer Book. The resistance of Scotland was followed by the failure of Charles to conquer the Scottish armies, and by the summoning of first the Short and then the celebrated Long Parliament. Charles was now face to face with his subjects, and the Long Parliament (1640) was resolved to check the king's unconstitutional practices. Strafford was executed, the Star Chamber, and the Ecclesiastical Commission were abolished, and Parliament kept in its own hands the power of dissolution. The Grand Remonstrance (November, 1641) destroyed all chance of a reaction in favor of Charles, and in 1642 war broke out. At first Parliament was worsted, and made an alliance with the Scots. Aided by this alliance, and by the ability of Cromwell and his Ironsides, Parliament won the battles of Marston Moor and Naseby, and gradually wore down the royal resistance. Hoping to take advantage of the breach between the Parliament and the army, Charles began intrigues which led to the invasion of England by the Scots on his behalf (the second civil war), and to his death in January, 1649, at the hands of Cromwell and his soldiers. The army, now supreme, established a commonwealth, which, under Cromwell, became the Protectorate. Till his death Cromwell staved off anarchy, and endeavored, though in vain, to govern by means of parliaments. But he was compelled to fall back upon the military force to preserve order, and after his death (1658) the restoration of Charles II. became inevitable. In Charles' reign the colonization of New England progressed rapidly. See UNITED STATES.

The Restoration (1660) was in many respects the beginning of modern times. The Star Chamber and High Commission Court did not reappear, the prospects of toleration were brighter, and attempts to produce harmony between the executive and legislature eventually resulted in cabinet government. James II. (1685-8), however, threw away all the advantages which Charles had gained. He ran counter to the law, the parliament, the church, and the dissenters. He made no attempt to oppose Louis XIV.'s schemes, and England remained a *quantité négligeable* in Europe. His determined attack upon the church brought about James's downfall, and in 1688 William of Orange was invited to come to England.

The flight of James II. and the accession of

William and Mary (1689) implied more than a mere change of rulers. The supremacy of Parliament was now assured, the theory of divine right disappeared, the liberty of the press and the pulpit was secured. By the Bill of Rights the crown was surrounded by constitutional checks, and by the Mutiny Act a standing army required the annual sanction of Parliament. The battle of the Boyne destroyed French hopes in Ireland, and the victory of La Hogue (1692) secured England's supremacy at sea. In 1707 the union of England and Scotland was effected. Anxious to be in a strong position when Queen Anne died, the Tory leaders hurried on the peace of Utrecht. Before, however, their preparations were complete, Anne died, and with the aid of the Whigs George I. ascended the throne (1714).

The reigns of George I. and George II. saw the union of the Whig landowners with the mercantile classes. The long ministry of Walpole (1721-42) saw the Protestant succession secured and the Hanoverians permanently established on the English throne. Walpole was succeeded by the Whig Lord Wilmington.

The Austrian Succession War (1740-8) and the Seven Years' War (1756-63) were, as far as England was concerned, primarily wars for supremacy in India and N. America. But while the peace of Aix-la-Chapelle (1748) proved only a truce, that of Paris (1763) marked the assured triumph of England in India and America, and the beginning of England's imperial policy. While the elder Pitt had by his ability and honesty raised politics to a higher level, John Wesley had done much to remedy the shortcomings of Walpole's church policy, and had stirred up a religious enthusiasm which had far-reaching social effects.

George III. (1760-1820) devoted all his efforts to increasing the power of the crown at the expense of the Whigs. The passage of the Stamp Act by Parliament in 1765 produced a great ferment in the American colonies. In 1775 the war of American Independence broke out, and, aided by the French and Spaniards, the colonists won the day. In 1783 the treaties of Paris and Versailles ended the war, and the independence of the United States of America was recognized. George III. placed William Pitt at the head of affairs (December, 1783), and he remained prime minister till 1801.

Pitt's ministry witnessed the industrial revolution which made England the first manufacturing country in the world; it coincided with a remarkable development of England's imperial responsibilities. The American War had roused Englishmen to a fuller realization of

their duties to their colonies and dependencies. Numerous India bills, a more enlightened view with regard to Ireland, and a tendency toward reforms, financial, political, and social, represent the principal effects of the American War upon home politics. To keep the peace of Europe as far as possible, and to restore England's prestige, Pitt, in 1788, formed with Prussia and Holland the triple alliance. The outbreak of the French Revolution in 1789 checked Pitt's reforming and peace policy, and in 1793 France forced England into war. Till the Peace of Amiens in 1802, hostilities with France continued in all parts of the world. At sea, and in India and Egypt, England was successful. A rebellion in Ireland in 1798 led to the union of England and Ireland in 1800. The following year Pitt resigned. In 1803 war between England and France was renewed, Napoleon being determined to gain command of the sea. The failure of the Moscow expedition was followed by the defeat at Leipzig and the invasion of France by the allies. Though Napoleon's imprisonment in Elba, his escape and subsequent defeat at Waterloo (1815), disturbed the allies for a time, his exile to Mt. Helena enabled the great powers assembled at Vienna to effect the settlement of Europe.

For an extended account of the War of 1812 between the United States and Great Britain, see the article WAR OF 1812.

England came out of the Napoleonic wars with enhanced prestige and increased possessions. It only remained for the accession of the liberal-minded William IV. and for the outbreak of 1830 to insure the passing of the great Reform Bill of 1832. The Victorian age, which produced able ministers such as Peel, Russell, Palmerston, Disraeli, Gladstone, and Salisbury, saw a remarkable development in every department of national life. During the queen's long reign the government of Ireland was improved and the British possessions in India, China, and Africa were vastly extended. Hongkong was acquired, and the Australian colonies rose to great importance.

The Crimean War was avowedly for the maintenance of Turkey as a check upon Russia, which was threatening the road to India (see CRIMEAN WAR). Of the same class have been the wars in Egypt and Afghanistan. Still more when India itself burst into insurrection was England called upon to interfere, and engage in the victorious but terrible campaigns which marked the suppression of the Mutiny. See MUTINY, INDIAN.

The other wars during that period have all

been connected with mercantile and colonial interests. The principal was the war with the Transvaal and Orange Free State in 1899-1902, ending in both these republics being annexed to the crown as British colonies (see SOUTH AFRICAN WAR).

From 1901, when Queen Victoria died, her son Edward VII. was on the throne till 1910. The nine years of his reign were noteworthy for the departure from traditional foreign policy in the alliance with Japan, the Anglo-French agreement and *entente cordiale*, numerous arbitration treaties, and the strong peace policy of the king personally. It was during the reign of Edward VII., also, that there began the political and popular struggle which resulted, under a Liberal Government, in the revolution of British national finance and the remodelling of the Constitution in a form which took away from the House of Lords powers which they had possessed for many centuries.

The accession of Mr. Asquith to the position of Prime Minister led to the promotion of Mr. Lloyd George to second in command of the Government, as Chancellor of the Exchequer. In 1908 a National Old Age Pensions Act was passed by Parliament. See OLD AGE PENSIONS. In 1909 Mr. Lloyd George introduced his famous budget. In September, 1910, the North Atlantic Fisheries Dispute with the United States, which had remained unsettled for more than a hundred years, was finally decided by arbitration at The Hague (see ATLANTIC FISHERIES ARBITRATION). In October, 1911, A. J. Balfour resigned from the leadership of the Conservative Party, and was succeeded by A. Bonar Law.

In December, 1911, King George and Queen Mary paid the first visit ever made by an English king and queen to India, where they were crowned Emperor and Empress of India at the great Coronation Durbar held at Delhi (see DURBAR).

Toward the close of 1912 Premier Asquith announced that if the House of Commons chose to amend the pending Franchise Bill so as to extend suffrage to women, the Government would support the measure. It was not, however, until 1917, in the midst of the war, that the British Parliament enfranchised women. Among important measures passed by the British Parliament in the last few years before the war were Acts providing for national insurance and regulating the hours for shops, the Minimum Wage Law, the Act passed May 19, 1914, disestablishing the Church of England in Wales (see DISESTABLISHMENT), and the Act providing Home Rule for Ireland, passed May

25, 1914 (see HOME RULE and SINN FEIN).

During the Great War the unity of the nation was demonstrated in a way unexampled since the Napoleonic wars which came to an end over a century ago, and the devotion of the British Dominions—practically independent nations—was demonstrated with convincing and dramatic force. The continuance of the war necessitated also important social changes in Britain itself, changes which will have a far-reaching effect on the life of the people in the future.

The focal point of Britain's reasons for entering the war is found in the ultimatum sent to Berlin on August 4, asking for an unequivocal assurance that Germany would respect the neutrality of Belgium. The request was refused by Germany and immediately Britain declared war. Not being a military nation, she had but a small army, and the utmost that could be done so far as soldiers were concerned was the immediate despatch of troops aggregating less than two hundred thousand to help France repel the German forces. The navy, which was in a state of readiness, was within a matter of hours taking up its positions to begin that strangle hold of Germany on the seas which was not relaxed until the surrender of the German fleet after the signing of the Armistice; Lord Kitchener became Secretary for War and issued an appeal for volunteers, which had a tremendous effect on all classes. Recruits also swarmed to the depots in Canada, Australia, New Zealand, and South African British Dominions and in certain cases came to London to enlist. Large numbers of Americans, roused by the issues involved, and especially by the invasion of Belgium, crossed the border into Canada and enlisted in the Canadian forces. Others came direct to England at their own expense and became units in the British regiments.

It was in the closing months of 1914 that Mr. Lloyd George, the Chancellor of the Exchequer, began to emerge as the leading patriot of the country and to show his forceful ability in connection with the war. Early in 1915 there were vigorous complaints that the British forces were not equipped with sufficient big guns or high explosives. In May, 1915, Mr. Asquith, the Prime Minister, re-formed the cabinet and established a coalition Government containing twelve Liberals, eight Unionists, and one Labor member, with Lord Kitchener as Secretary of War, and Mr. Lloyd George as Minister of Munitions, a new office created to meet the emergency. As the war progressed, labor became constantly more power-

ful and attained a position where it was one of the controlling influences in the life of the nation, while many of its projects regarded as Socialistic were brought into effect for the national benefit. See RECONSTRUCTION.

Mr. Lloyd George became Prime Minister in the place of Mr. Asquith at the end of 1916 and reconstituted the Cabinet which adopted increasingly vigorous measures in all directions in order to hasten the winning of the war. It was he, also, who on behalf of Britain signed the Peace Treaty at Versailles in June, 1919. This signing marked the opening of a new chapter in the history of England.

The war had called forth almost superhuman efforts and the British contribution to those efforts had been a major part of the sum total in man power and economic resources. Thus, while she had emerged one of the victors from the war, it was with a huge national debt, including for the first time for centuries an external debt of vast proportions and faced with the seemingly impossible task of recovering her foreign trade and reorganizing her home industries. Politically, too, there were domestic problems of great magnitude. It was largely a personal triumph for Mr. Lloyd George, when, on December 6, 1921, an agreement was signed with the Sinn Fein party which called the Irish Free State into existence with the status of a Dominion. See IRELAND; *History*. In foreign affairs Mr. Lloyd George could point with satisfaction to the conclusion of the Washington Naval Treaty and to the Four Power Pacific Treaty, which, to the great satisfaction of the Dominions and the United States, had replaced the Anglo-Japanese alliance.

Nevertheless the Coalition did not last through 1922. The Conservatives took office in October of that year under Mr. Bonar Law, to be succeeded later by Mr. Stanley Baldwin. In 1923 Mr. Ramsay MacDonald, leader of the Labor Party, which, though only the second strongest party, took office, and after only a few months of existence Parliament was dissolved on October 9, 1924. In the election following, Mr. Baldwin became Prime Minister and remained in office until the general election of June, 1929, from which the Labor Party emerged the strongest single party, and Ramsay MacDonald again became Premier.

The financial problems forced upon England by the war were met by the courageous policy of taxing rather than borrowing. The largest single item of revenue is Income Tax.

One of the most difficult post-war problems was the legacy of debts between the Allies and reparations due by Germany. On August 1, 1922, Great Britain laid down in the famous Balfour Note the policy she was to pursue with regard to war debts and reparations. In December, 1922, the British Government concluded negotiations with the United States for the repayment of the war debt, and a funding agreement was later signed.

The close participation of Great Britain in the work of the League of Nations since its beginning has been evidenced by the personal attendance at its meetings of the Foreign Secretary. The Conservative Secretary of State for Foreign Affairs took the lead in the negotiations which culminated in the Treaty of Locarno. The influence of Great Britain was also thrown into the scales in favor of admitting Germany to the League of Nations with a permanent seat on the Council, which took place in September, 1926. The next great step towards world peace and disarmament came on the initiative of the United States, namely the Kellogg Pact and to this Great Britain gave her hearty support.

In furtherance of the general desire for a limitation of armaments a Conference was held in London, early in 1930, of representatives of the leading naval powers. Despite the failure of France and Italy to find a basis of agreement, Great Britain bound herself, as did the United States and Japan, to restrict her tonnage. The Labor Government found itself in increasing difficulties in 1931, as a result of its failure to remedy the economic distress of the country and, on August 24, Mr. MacDonald tendered the resignation of his Ministry. A National Government was formed under the same Premier, four Conservatives and two Liberals taking office in a Cabinet of ten members pledged to drastic economies and radical measures in an effort to re-establish public finances on a sound footing. The mounting cost of unemployment insurance, the prospect, in the summer of 1931, of a budget deficit of \$600,000,000, and the accumulation of three-quarters of the world's gold supply in the central banks of the United States and France created a situation which rendered maintenance of the gold standard impossible. On Sept. 21, 1931, the House of Commons voted, therefore, to suspend the requirement that the Bank of England should sell gold at a fixed price.

The drastic proposal to abandon the traditional free-trade policy of England as an emergency measure to meet existing condi-

tions warranted the dissolution of Parliament and an appeal to the electorate on the issue. The National Government were returned to office, Oct. 27, 1931, and Mr. MacDonald continued at the head of the Government.

The coalition cabinet lost popular favor, and in 1935 Stanley Baldwin became Prime Minister.

The British Government, on February 16, 1937, announced a £1,500,000,000 rearmament program to begin in April and designed to triple the normal expenditure on defense.

In December, 1936, the supremacy of Parliament as the governing body was demonstrated by the action of Prime Minister Baldwin in refusing to allow King Edward VIII to contract a morganatic marriage with Mrs. Wallis Warfield Simpson, an American divorcee. See EDWARD VIII, ABDICATION.

Upon the voluntary retirement of Mr. Baldwin in 1937, Neville Chamberlain became Prime Minister.

In 1938 a pact was made between the Government and Ireland, which it is believed will settle many long standing differences and promote friendship with the Irish people.

During 1938 and 1939, German and Italian aggressions gave rise to gravest fears for the peace of Europe; and the British Government labored in close cooperation with the Government of France to prevent the outbreak of war, meanwhile taking measures on an unprecedented scale to rearm the country.

The visit of King George VI and Queen Elizabeth to Canada and the United States, 1939, marked for the first time the presence of a reigning British Sovereign on the Western Continent.

In the spring of 1939 England signed a treaty with Poland pledging armed assistance to the latter in the event of invasion by an aggressor. Accordingly on Sept. 1, 1939, three days after German troops had invaded Poland, Eng., almost simultaneously with Fr., declared war on Ger. War restrictions and economy immediately went into effect. Major cities were blacked-out at night, new taxes were levied, and hundreds of thousands of children and women were removed from cities to homes in the country. Within three months Eng. and Fr. had agreed on practically all phases of war policy and had reached a point of cooperation that had not been reached in three years of the World War (1914-1918). The French were in command of all troops on the Western Front, the English directed all sea forces, and the war economies of the two nations were joined.

Many English troops were transported to Fr. and took positions at the front. In the 1939-40 winter there was very little fighting either on land, sea, or air. In the early spring of 1940 Germany launched an attack on Denmark and Norway and quickly overran both countries, forcing British troops which had been rushed to Norway to evacuate. The Nazis then assaulted Belgium, the Netherlands, Luxembourg and France. Despite the predicted invincibility of the French Maginot line, the Germans came in behind it after quickly defeating all Allied forces in the Low Countries. France capitulated to the invaders in June and the English army was evacuated through Dunkirk but it abandoned practically all heavy equipment. For the balance of 1940 the chief fighting was limited to the air and sea. In the meantime Winston Churchill had succeeded Chamberlain as Prime Minister. In the late summer and fall of 1940 all major cities in England were savagely lashed by Hitler's air force. London, Liverpool, Birmingham, Coventry and others had large areas in demolished condition. There was a comparative lull in the winter of 1940-41 although the English African forces were slowly defeating the Italians in east Africa. In northern Africa the tide of war flowed back and forth across Libya, with neither side winning decisively. When spring came again Germany quickly overran and conquered all the Balkan states, sometimes by diplomacy, often by armed invasion. In Greece and in Crete the English met the Nazis and on both occasions were forced to flee. In June 1941 Hitler's hordes assaulted Russia, and the splendid fighting of the Russian army gave England a respite from air bombings. The summer of 1941 saw an increasingly powerful British air fleet dealing mighty blows to the industrial cities of western Germany. In 1942 a new treaty was made between Great Britain and Russia. Japan attacked British possessions in the Pacific 1941, and in 1942 seized Malaya and Singapore and invaded Burma. After the Japanese attack at Pearl Harbor, U. S. forces joined with British forces in successful campaigns in N. Africa and the island of Sicily (1942-1943) and in the invasion of Europe. (continuation in World War II Chronology)

1485-1688.—Froude's *History of England*, 1527-88; Lingard's *History of England*, vols. vi-xiv.; Carlyle's *Letters and Speeches of Cromwell*; Macaulay's *History of England*, 1660-1702; Lodge's *The History of England*

from the Restoration to the Death of William III. (1910).

1688-1837.—Lecky's *History of England in the 18th Century*; Massey's *History of England, 1745-1802*; Bright's *Constitutional Monarchy*; Erskine May's *Constitutional History, 1760-1860*; Walpole's *History of England from 1815*, vols. i.-iii.; Justin McCarthy's *Four Georges*; Robertson's *England under the Hanoverians* (1911); May's *The Constitutional History of England Since the Accession of George III.* (3 vols., 1911).

1837-1931.—McCarthy's *History of Our Own Times*; Molesworth's *History of England, 1830-74*; Harding's *From Palmerston to Disraeli* (1913); Marriott's *England Since Waterloo* (1913); Cook's *Britain's Part in the War* (1916); Dilnot's *England After the War* (1920); Keith's *The Sovereignty of the British Dominions* (1929), and *A Constitutional History of the British Empire* (1930); Amos' *The English Constitution* (1930); Seigfried's *England's Crisis* (1931); Elliott's *The New British Empire* (1932).

England, Church of, the established church of England. The title is now, strictly speaking, limited to the Establishment in England and certain Crown colonies, though the term is sometimes loosely, but unconstitutionally, applied to the Anglican Church in Ireland, Scotland, and British possessions generally.

In 1533 the Convocations of Canterbury and York agreed that the king, Henry VIII., was the supreme head of the Church of England. In 1534 appeals to Rome were disallowed, the confirmation of bishops by the Pope was abolished, and the Convocations declared that the 'bishop of Rome hath not by Scripture any greater authority in England than any other foreign bishop.' Parliament then confirmed the supremacy of the king. In 1536 a statute abolished the 'authority of the bishop of Rome.' The final separation took place in 1570.

See also CHURCH, ANGLICAN. For the Anglican communion in the United States, see PROTESTANT EPISCOPAL CHURCH.

English, Thomas Dunn (1819-1902), American writer, was born in Philadelphia. His works include the ballad *Ben Bolt*, set to music by Nelson Kneass in 1840.

English Channel (*La Manche*, 'Sleeve.' of the French, and the *Mare Britannicum* of the Romans), the narrow sea which, since the glacial period, separates England and France. It occupies 23,000 square geographical miles, and contains the Channel Isles, Ushant Isle,

Isle of Wight, and many islets and rocks, especially off the coast of Brittany. Since Captain Matthew Webb swam the Channel in 1875, numerous powerful swimmers have attempted that difficult feat. It was accomplished by T. W. Burgess in 1911; H. Sullivan, C. Toth and E. Tirabocci in 1923; Miss Ederle, Mrs. Corson, H. Vierkotter and G. Michel in 1926. By 1939 seven more women and six more men had crossed.

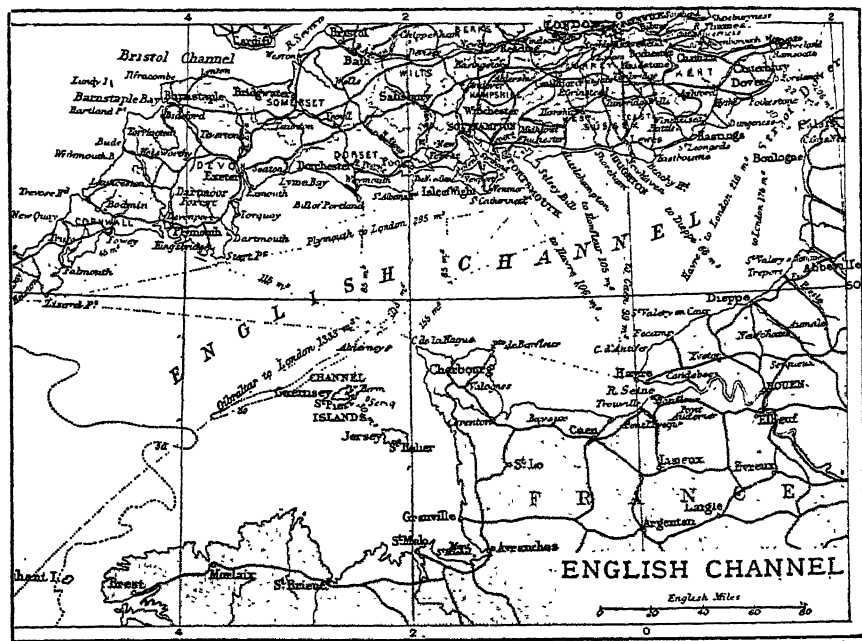
English Language, in its original meaning, was the language of the Engle, or Angli, one of the three Germanic peoples who in the 5th-6th centuries settled in Britain. In the 9th century King Alfred called his language *Englisch*. Early English Latin writers often referred to the *Saxon tongue*, while at that time the Welsh, Irish and the Scottish Gaels always used *Saxon* as a general name for the English and their language. But, in general, 'English' has, at any rate from the beginning of the 8th century, been the accepted name for the Germanic language of the British Islands. It is customary to use the name Anglo-Saxon for the oldest form of English, although it is preferable to speak of the language from the beginning as English, distinguishing its three chronological periods by the generally accepted names of *Old English*, *Middle English*, and *Modern English*. The Old English period ends about the year 1150, and the Middle English period about 1500. Middle English is, however, much less a unity than either Old or Modern English. An Englishman of the present day has little difficulty in reading the Middle English of Caxton or Malory; but Caxton and Malory would have been hopelessly puzzled by the *Ormulum* (about 1200), or even by the *Ayenbite of Inweyt* (1340).

During the Old English period, the differences between English and the Low German dialects of the Continent were comparatively slight. An Englishman of the 9th century would have had little difficulty in conversing with a Continental Saxon. The existing remains of Old English exhibit four well-marked dialectal varieties—West Saxon, Northumbrian, Mercian and Kentish. The West Saxon is the dialect in which the bulk of the literature is written. Its purest form is found in the writings of King Alfred. Apart from the glosses written in the 10th century, the only remains of Northumbrian are a few runic inscriptions, a few lines of Cædmon's Hymn, the verses said to have been composed by Bede on his death-bed, and a riddle. Mercian is mainly represented by glosses; Kentish by glosses and homilies. Old English had retained, without any

very considerable loss, the inflectional system of the original Germanic tongue.

While the accident of the West Saxon dialect underwent no very marked change during the Old English period, the history of the Northumbrian dialect shows some noteworthy developments in the direction of Modern English long before the date of the Norman conquest. One of the reasons why these changes appeared so much earlier in the north than in the south is, doubtless, that the Northumbrian inflections were less lucid than those of the other dialects, so that the need for intelligibility had to be met by new devices. The vo-

matical inflections; and it is, doubtless in part, from this cause that in the early Middle English period the grammar of the Northern dialects was much more simple, more 'modern,' than that of the dialects of the South. As the extant Old English literature is mainly of Southern origin, it does not adequately represent the extent of the Scandinavian influence on the language. Yet we find in it more than a hundred words of Danish or Norse origin. Many of the commonest words of Modern English—such as 'take,' 'get,' 'leg,' 'egg'—are of Scandinavian origin, and, though not found in literature till later, must have been adopted



cabulary of Old English is, in the main, Germanic: from the language of the Celtic Britons Old English borrowed hardly anything. The Old English words now recognized as probably of Celtic origin do not amount to a dozen.

When, in 1013, the throne of England was seized by a Danish king, the Danish influence was extended to the southern part of the country. The language of the Danes and Northmen closely resembled Old English in vocabulary, but differed from it materially in the details of grammar. The natural result of the mixture of the two peoples in the northern and midland parts of England was, therefore, to accelerate the decay of the Old English system of gram-

before the date assigned for the end of the Old English period.

Although the Angles, and perhaps the Saxons, were acquainted with the runic alphabet, and used it for lapidary inscriptions and similar purposes, it is not probable that Old English had any written literature until the Latin alphabet was introduced by missionaries from Rome in Kent and the Irish missionaries in Northumbria. The Latin letters, with the phonetic values which they had in the Latin pronunciation of the period, served fairly well for the expression of Old English sounds.

A comparison of the 'early Middle English' of the end of the 12th century with the 'late

Old English' of its beginning might at first sight suggest that the language had undergone a wonderfully sudden transformation. The truth, however, seems to be that the changes which in the spoken language had begun even before the conquest were for a time disguised by a traditional orthography, and the literary preservation of old grammatical forms. From the spelling of local and personal names in *Domesday Book*, it is evident that some of the distinctive features of early Middle English existed already before the end of the 11th century. After the conquest the boys who were intended to be clerics learned French as well as Latin. The effect of this new state of things is seen clearly in two works written at the very beginning of the 13th century—the metrical version of the gospels, called *Ormulum* from the name of the author, Orm or Ormin, and written in the East Midland dialect; and the translation of Wace's *Brut* by Layamon, written in Worcestershire, though the dialect of the earlier of the two mss. is decidedly Southern. These texts appear to represent the actual language of the time, without mixture of archaisms. The phonetic notation employed is still traditional: it is Old English with improvements suggested by French spelling, most of which had been already adopted in the 12th century.

The vocabulary of Orm abounds in Scandinavian words, but words of French origin are almost entirely wanting. In the long poem of Layamon, though it is a translation from French, there are only one hundred and seventy French words; in certain Southern works of somewhat later date, as the *Ancren Riwle* and the *Kentish Sermons*, the number is much larger in proportion. It is historically certain that in the latter part of the 13th century a considerable portion of the population of England was bilingual, and many of the mss. of this period are written in a phonetic orthography based almost wholly on French analogies. The results of French influence on the vocabulary at this period are well known; its effect on idiom has been little investigated, but was probably greater than has been generally supposed.

The oldest extensive specimens of Northern Middle English are a metrical *Psalter* (late 13th century), and the *Cursor Mundi*, a poem of over 29,000 lines (1300, or earlier). Nearly contemporary examples of East Midland are the poem of *Havelok* (about 1300), and the *Handlyng Synne* of Robert of Brunne (1303). The Southwestern dialect of this time is represented by the *Chronicle* of Robert of Gloucester

and the South-English *Legendary*. The vocabulary of all three dialects contains a large number of French words.

The West Midland dialect is extensively represented by the alliterative poetry of the latter half of the 14th century; but the poets themselves appear to have frequently employed forms belonging to other dialects. The French element is also very large. The language of Langland's *Piers Plowman*, the three recensions of which are dated by Professor Skeat respectively 1362, 1377, 1393, is a southern form of West Midland, modified by the author's long residence in London; but the extant mss. were written in different parts of the country, and only imperfectly represent the original dialect.

The London dialect was originally of a definitely Southern type; but during the 14th century the language of the educated classes, as represented in official documents, underwent a progressive assimilation to the East Midland dialect. The Londoners, Chaucer, Gower, and Hoccleve, write what is substantially an East Midland dialect with some Kentish forms. But the language of poets was, in these respects, doubtless more conservative than ordinary speech. London English had become the standard literary language before the end of the 15th century. The latest important examples of Southern dialect are the *Life of St. Editha* (about 1425) and *The Wright's Chaste Wife* (about 1462). The poems of Audeley (about 1426) represent the Shropshire form of West Midland. The huge collections of romantic poetry and religious prose in the mss. of the Yorkshireman Robert of Thornton, written about 1440, are in Northern English; they mainly consist of transcripts from 14th-century originals, but include many pieces of later date. The same dialect is represented in the *Towneley Mysteries* (about 1460). The adoption of London English in the works printed by Caxton, whose press was established at Westminster in 1477, doubtless contributed powerfully to hasten the disappearance of the other dialects from literary use.

During the 15th century the literary vocabulary received a large number of accessions from Latin and French. Lydgate, Malory, and Caxton were great translators and adapters of foreign literature, and, like Wycliffe before them, were accustomed freely to Anglicize the words they found in their originals. The inflectional changes since 1500 have been very slight. In syntax the change has been far greater; and it is hardly too much to say that any book written since 1500, even if modern-

ized in spelling, could be dated within fifty years from the evidence of syntax alone. But the history of Modern English syntax consists of a multitude of separate facts which can hardly be grouped under any general formulas of tendency, so that the subject must here be passed over.

The most conspicuous feature of the history of Modern English is the enormous increase of the vocabulary by adoption from foreign languages. Latin and French contributed largely; the peculiarities of Greek rendered it a source for many technical and scholarly terms; more lately, the increased knowledge of the European literatures, and the intercourse between England and remote parts of the world, which have characterized the modern period, have had the result of greatly increasing the number of foreign words in the language. From Italian came many terms in music and the fine arts; from Dutch, a few terms in painting (*landscape, sketch*, etc.), and many nautical and other words. On the whole, it may be said that Modern English, by its pointed brevity, is altogether admirable as a business idiom, and that for the purposes of literature, it is difficult to handle, but in skilled hands is capable of an extraordinary degree both of subtlety and of force.

The history of English sounds is highly complicated, but some of its main features admit of being briefly summarized. The words that have come down from Old English retain nearly all the original consonant sounds, and nearly all the short vowels in closed syllables, with comparatively little change. But the long vowels, and most of the short vowels in open syllables, have by insensible degrees been totally changed. The following examples will illustrate the most conspicuous of the changes that have taken place. For the Old English sounds the Italian or German values of the vowel letters may be taken as approximately correct; but $y = ii$, $æ = a$ in 'hat,' $ē = e$ in 'there.'

The most noteworthy phonetic characteristic of Modern English is the great force of the stress-accent, which causes the unaccented vowels to be obscured, and often to be almost inaudible.

In English, as in most other languages, the spelling has changed much more slowly than the pronunciation. Considered as a representation of the sounds of the spoken language, the present English orthography is one of the most unsatisfactory in existence. Almost every sound is expressed in several different ways, and almost every symbol (letter or group of letters) has several different phonetic values.

On the whole, our present spelling is that of the early 16th century rendered uniform—i.e. we may now spell a word in *one* only of the several ways which were then regarded as permissible. The functional differentiation of *i* and *j*, and of *u* and *v*, introduced (after Continental example) in the first half of the 17th century, is the only important improvement in a phonetic direction which English spelling has undergone since the time of Wynkyn de Worde. At present there is little prospect that the efforts which are being made for spelling reform will be successful, the practical difficulties being much greater than the advocates of reform are commonly disposed to acknowledge.

Basic English has been called a 'second language between all countries.' It is defined as English made simple by limiting the number of words to 850 and the rules for using them to a minimum. Consult Richards, *Basic English and Its Uses* (1943).

The following list is confined to books which may be considered still serviceable.

1. OLD ENGLISH: E. Siever, *Old English Grammar*, translated by A. S. Cook; T. N. Toller, *Anglo-Saxon Dictionary*; H. Sweet, *Students' Dictionary of Anglo-Saxon*; also his *Anglo-Saxon Reader*.

2. MIDDLE ENGLISH: F. H. Stratmann, *Middle English Dictionary*; Mayhew and Skeat, *Concise Dictionary of Middle English*; also his *Specimens of English Literature, 1394-1579*.

3. MODERN ENGLISH: Abbott, *Shakespearean Grammar*; H. Sweet, *New English Grammar*; Jespersen, *Growth and Structure of the English Language*; Fowler, *Modern English Usage*; the new *Oxford Dictionary*.

English Literature. *Anglo-Saxon, or Old English.*—English literature, like the language is made up of many elements, contributed by various races. To the Celts it owes the romances of King Arthur, and to the Gaels of Scotland and Ireland a number of its folk-tales and heroes. As an ancestral stock, it begins with the coming of the Anglo-Saxon tribes from the Continent. These tribes brought with them a poetic literature of fable, folk-legend, and history which already showed some of the qualities of greatness. There can be little doubt that *Widsith* and *Beowulf* took written form during the 7th century. During the same century Caedmon lived and died, and the next century saw the flourishing of Northumbrian literature, and the creation of the greater part of extant Old English poetry, which has, however, come down to us transdialected into the West Saxon of the later Southern literature. Before the Old English *Beowulf* took written

form, it had already passed through a period of growth and development. The following lines are quoted from *Beowulf* and serve to illustrate a number of points.

(Not there the wave-floater did the wind
o'er the billows
Waft off from its ways; the sea-wender farèd,
Floated the foamy-neck'd forth o'er the waves,
The bounden-stemm'd over the streams of the
sea,
Till the cliffs of the Geats there they gat them
to wit.)

These are indications of facts that may be thus recorded: (1) Old English possesses a great number of poetical synonyms, many of which are never used in prose; (2) it 'is particularly happy in composition of two or three words together'; (3) there is an extended use of 'parallelism': two or more succeeding lines or half-lines often repeat the same statement in other words.

The theme of *Beowulf* is that of a hero-saga. The first adventure concerns Beowulf's defeat, in a terrible hand-to-hand battle, of the monster Grendel. The monster flees to a haunted pool; there, after another struggle, he is slain, and Beowulf swims ashore with Grendel's head. Finally Beowulf is overcome in battle with the Fire Drake (dragon), but not until this creature also is slain. The epic is a mixture of fact and fiction; furthermore, the version which we now possess has been partly Christianized.

From what has come down to us we know that there were once several complete Old English epic lays, some of them perhaps even finer than *Beowulf*. On a level with its monuments in epic are the Old English elegies, for its lyrics are all of an elegiac cast. Common to them all, common indeed to the whole of the pagan poetry, is a note of deep melancholy, of fatalism. Another feature of this old poetry is its *Charms*, very early heathen verses, but often worked over by a Christian 'scop.' Probably here we touch the earliest stratum English poetry. Then there are 'freaks' in this ancient literature, such as the Rime Song, and the Rune Poem, each verse of which opens with a character in the runic alphabet, and then proceeds to expound the meaning of its name.

Old English prose is best represented by King Alfred's writings. The *Chronicle* is intensely interesting in its spirited narrative of the Danish wars; but these are almost the only pleasant spots in a dreary, well-nigh barren waste.

The Grein-Wülker *Bibliothek der Angelsächsischen Poesie* (1857-58; new ed. 1883-

1897) contains the complete text of all the Old English poetry. For histories of early English literature consult Stopford Brooke's *English Literature from the Beginning to the Norman Conquest* (ed. of 1898), and the first volume of the *Cambridge History of English Literature* (1907), which contains complete bibliographies.

Middle and Modern English.—The point at which the continuous and unbroken, as distinguished from the preliminary or 'Old English,' history of English literature begins is uncertain. In three documents, however, of great bulk and importance—the earliest version of Layamon's *Brut*, the curious unrhymed but strictly metrical *Ormulum*, and the prose treatise of the *Ancrun Riwele*—we have pieces which almost all competent authority assigns to years very close to the junction of the 12th and 13th centuries.

Layamon, in his *Brut*, retains much of the Old English tradition; but he adds an extensive use of Norman-French material. His work marks definitely the beginning of the Middle English period, for he is the first writer of literary importance who marks the coming of a new era. It 'came into his mind,' he said, to tell in verse the history of England. His 'history,' especially the portions dealing with Arthur, brings romance to literature.

During the 13th century itself fresh contributions to English literature, which in most cases had French and Latin patterns, if not always direct originals, before them, multiplied not very fast but with a steady tide—the important version of *Genesis and Exodus*, showing the *Christabel*, or loose ballad metre already in existence; some interesting verse Proverbs, probably modernized from older forms; many Homilies, etc.; and the capital *Owl and Nightingale* poem, 'the herald of the love-theme' in English literature.

Towards 1300 a great vernacular verse history of England, by Robert of Gloucester, and a huge collection of *Saints' Lives* (also vernacular, and probably, in part at least, by the same hand), made their appearance.

The three famous examples of metrical romances are *Havelok the Dane*, *King Horn*, and *Sir Tristrem*. They are almost certainly anterior to 1300. *Horn* and *Havelok* are known in French versions, 'but it is improbable that any French version was the origin of the English.' These stories are obviously of northern and not Latin racial parentage. *Sir Tristrem* uses a lyrical stave, 'unlike anything that was permissible in the French schools of narrative at that time.' Prose, however, is still very

much behindhand, and is confined to religious purposes.

This quickening and multiplying can be still more clearly seen in the first half of the 14th century. The romances multiply enormously, and make literature, in a way, really popular. The Old French and Provençal models are further studied, and some really exquisite lyrics, slightly elaborate and formal, but full of sweetness and poetry, appear. Most remarkable, however, is a sort of Scripture history, mingled with much apocryphal matter, the *Cursor Mundi*, which is singularly original and vigorous, and which serves as canvas for the great outburst of miracle or mystery plays in the northern countries.

About the middle of the century (1350) comes the work of a great poet who has never been identified by name. The poems *Gawaine and the Green Knight*, *The Pearl*, *Cleanness*, and *Patience* are all by one writer whom modern opinion rates most highly. This writer was born about 1330, somewhere in Lancashire, or possibly a little further north. He had absorbed the spirit of the Old English poets, knew the chief products of Early French literature, and Virgil and other Latin writers. He was also familiar with the Bible. We have in him, therefore, a man with a truly literary background.

It is not, however, till the last half of the 14th century that really characteristic and individually important authors, in some cases, at any rate, of known and traceable personal history, arise. John Gower (?1330-1408) has a special importance, because of his trilingual expertness in French and Latin as well as in the modern tongue. His Latin often has singular quaintness and vigor, and his English, which is practically the same as that of Chaucer, he uses to tell simple and clear narrative. Nor is he by any means devoid of poetical feeling.

Very different is the second poet, William Langley, or Langland (?1330-?1400), the presumed author of *The Vision of William concerning Piers the Plowman*. In a dialect which looks (though it is not) more definitely English than Chaucer's, *Piers Plowman* combines the religiosity of the whole middle ages, the allegory of the *Romance of the Rose*, the fierce popular resentment at corruption in church and state which everywhere distinguished the late 14th and the 15th centuries, and a fourth quality, or rather collection of qualities, specially English—an odd conservatism blended with radical leanings, a singular power of slight but

strong character sketching, and a magnificent disdain of external unity in composition.

With Geoffrey Chaucer (?1340-1400) there is no need of drawback or apology. 'Here is God's plenty,' said Dryden of him two hundred years ago, and nothing better can be said to-day or forever. His great formal achievements are the freeing of the octosyllabic couplet from part at least of the insignificance which was its bane; the selection from other stanza-forms of seven-lined group—the so-called 'rhyme-royal'—to which he gave great accomplishment; and above all, the adoption—probably from the French, though there had been signs of its development earlier in English—of the heroic couplet, or rhymed decasyllable, which has ever since been one of the greatest of English poetical vehicles. His next and higher title is the elaboration of a kind of phrase which is absolutely new in English, which took his contemporaries by storm, and retained the admiration of posterity. Above all, Chaucer succeeded in substituting for the gracious but faint portraying of mediæval writers, such a variety of vividness and vigor of description and conversation that there is hardly anything that he fails to give.

It is in *Troilus and Criseyde* that Chaucer's true greatness as a poet first appears, although his modern readers usually begin with the later *Canterbury Tales*. *Troilus* concerns an episode in the mediæval legend of the siege of Troy, some part of which Chaucer translated from Boccaccio. But Chaucer uses his materials as he pleases, altering, transposing, and omitting to suit his own purposes. In *The House of Fame* Chaucer was influenced by Dante. *The Canterbury Tales*, particularly *The Prologue*, is a mirror of the English people of his day.

At this time Scottish literature began to be of interest. King James I. (1394-1437), in his *Kingis Quair*, ushered in a school of Scottish poetry. Henryson (?1430-?1506), Dunbar (?1465-?1530), and Gavin Douglas (?1474-1522) produced work partly in Chaucerian literary shape but in Scots dialect.

Dunbar's *Twa Maryit Women and the Wedo*, so powerful north of the Border, resulted south of it in tamer imitations. Lydgate and Occleve (both about 1370-1450)—though scholarly or scholastic perversity has sometimes endeavored to wipe away the reproach of the former—hardly even in the days of greatest injustice to the middle ages received too harsh judgment for tedious volubility, coupled with absence of poetic grace and color.

Prose—which had at last taken some rank in



John Masefield



George Bernard Shaw



H. G. Wells



W. Somerset Maugham



Arnold Bennett



John Galsworthy

general English literature during the last quarter of the 14th century with the work (mainly, it is true, still translation) of Chaucer himself, of Wycliffe (?1320-84), of the historian John of Trevisa (1326-1412) and perhaps of the mysterious and delightful Mandeville—deserves less severe language. It produces (c. 1470) one glorious and indeed unique fruit in the great prose romance *Le Morte d'Arthur*, by Sir Thomas Malory; it has in Sir John Fortescue (?1394-?1476) a vigorous writer on law, history, and politics; while in other and less intrinsically interesting examples it still enriches the vocabulary.

The stages by which comparative barrenness in England passes to the full fertility of the great Elizabethan time are by no means rapid, and hardly even consecutive in improvement. Interest in prose is maintained by the industrious translator, Lord Berners (1467-1533), who, especially in his version of Froissart's *Chronicles*, achieves a tone of somewhat belated prose romance inferior only to Malory's; and by Sir Thomas More, (1478-1535), whose principal work, however, the *Utopia* (1516) was written in Latin, and never translated into English by himself or during his lifetime.

The best prose of the period is that of Thomas Cranmer (1489-1556) preserved in the liturgy of the English church, and in Miles Coverdale's (1488-1568) translation of the Bible. The chief poets are Stephen Hawes (d. 1523?); Alexander Barclay (?1475-1552), translator of the German *Ship of Fools*, and author of some semi-satirical *Eclogues*; and the eccentric John Skelton (?1460-?1529), chiefly remembered to-day for his morality play *Magnificence*.

These writers are mainly characteristic of the first quarter of the 16th century; the second is best represented by the twin poets Wyatt (?1503-42) and Surrey (1517-47), and by the prose writer Roger Ascham (1515-68). These poets abandoned allegory; they wrote of themselves—of their own feelings and emotions. Surrey's translation of the second book of Virgil's *Aeneid* is the first English example of blank verse. Ascham's prose style is the first that can be said to be fit for the miscellaneous purposes of prose.

The third quarter of the century and a little more, till about the two-and-twentieth year of Elizabeth, see little work of positive goodness. During the whole of this time, however, an immense literary industry was being carried on. Both prose and verse translations from the classics multiply; and the drama, though still extremely crude, exhibits fervor of work. Long

before, the purely mediæval *mystery play*—of which we have four great collections: the *York*, *Towneley*, *Coventry*, and *Chester Plays*, with minors representing the late 14th and the 15th centuries—has passed into the only half mediæval *morality*, and both have given way to the nondescript but exceedingly germinal *interludes* of John Heywood (?1497-?1580) and others. So the interlude passes into rough chronicle play, such as the *King John* of Bishop Bale (1495-1563), into elementary comedy, and other developments; while what we may call the romantic mysteries, combining with the Senecan tragedy, and giving its first example in *Gorboduc* (1561), by Sackville and Thomas Norton (1532-84), pass into a new tragedy of a very chaotic kind.

There is no more climacteric year in the history of English or of any other literature than the year 1579-80. Within the twelve-month appeared the two books which mark the actual bursting of the aloë into Elizabethan verse and prose—Spenser's (?1552-99) *Shepherd's Calendar* and John Lyly's (1553-1606) *Euphues*. We cannot pin down drama quite so exactly, but it is practically certain that the earliest work of the earliest university wits (Lyly himself and Peele—?1558-?97) dates from almost the same time. The style of Lyly's *Euphues* (1579) became a fashion of far-reaching importance. Every sentence is filled with references to a fictitious natural history and strained ornaments. Simile, alliteration, and antithesis all contribute to the artificiality of this 'courtly' language. The imitation of Lyly became a stumbling block to the clearness of expression of the lesser Elizabethan writers.

By 1580 English has one name of the first class, acknowledged even abroad, and a few interesting ones of the second; by 1660 it is already on a level with any national body of letters, ancient or modern, in respect of bulk, variety, and beauty. Shakespeare and the whole *opus* of the so-called Elizabethan drama have constituted the English theatre; the promising but, save in one or two departments, rudimentary germs of English poetry have broken into a marvellous, an almost bewildering, volume and variety of verse. Prose, dropping a little behind in the first outburst of the diviner harmony, and never, save in Richard Hooker, quite equalling the formal advance of verse, has almost indefinitely multiplied its applications, and has at last reached the marvellous performance of Jeremy Taylor (1613-67), of John Milton (1608-74), and of Sir Thomas Browne (1605-82).

To the lover of poetry the great merit of

Spenser is the mass and quality of the poetic pleasure which he has provided; to the student of history it lies in the dead lift which he gave to English poetry itself. To this day the magnificent stanza which he invented for his greatest poem remains unapproached for certain special uses, and those not few, and has been able to carry 18th and 19th century diction as well as 16th. On the other hand, Spenser, experimenting with a rough form of artificial poetic diction in the *Calendar*, perfected it in the *Faerie Queen* and other poems, and practically left it to all successors. The sonneteers of the later years of Elizabeth, from Sir Philip Sidney (1554-86) downwards, are sometimes exquisite; nor should we fail to mention Sidney's prose pastoral romance *Arcadia* and his perfect *Apologie for Poesie* (1595). The satirists—Joseph Hall (1574-1656) and others—who came a little later, set up a pattern which Dryden and Pope were afterwards to tread; the historians, like Drayton (1563-1631) and Daniel (1562-1619), are the reverse of contemptible.

But the best poetry—lyric, reflective, narrative even, and of most other kinds—is to be found in the drama. The predecessors of Shakespeare—such as Peele (?1558-97) and Greene (?1560-92), Thomas Kyd (?1557-?1595), and above all Marlowe (1564-93), who, more than any other, made Shakespeare's achievements possible; Shakespeare himself (1564-1616) and his younger contemporaries, from Ben Jonson and Fletcher (1579-1625) and Beaumont (1584-1616), through Chapman (?1559-1634) and Middleton (?1570-1627) and Webster (?1580-?1625) to Dekker (?1570-?1641) and Heywood (d. 1650); his successors, from Massinger (1583-1640) and Ford (1586-c. 1639) down to Shirley (1596-1666)—did more than create a whole cosmos of character and poetry in separate personages and passages, incidents, and inserted songs: they actually created a new drama.

The later part of the period—that belonging to the 17th century—contributes, at the beginning, the greatest dramatic work of all,—the summits of Shakespeare's art, the trinity of Ben Jonson's greatest successes, the whole work of Beaumont and Fletcher; but it witnesses a gradual yet a decided decline, and when the triumph of Puritanism closed the theatres at the beginning of the fifth decade, a very un-Puritan literary critic might have been puzzled to give literary reasons for keeping them open.

The perfected plain style of Hooker (1554-1600) at the close of the 16th century, and the

fantastic ornament of Lyly, combined to produce in Francis Bacon (1561-1626) a style of unmatched pregnancy and of a sort of sententious grandeur. To Bacon we owe not only the literary values of his *Essays* but also the beginnings of modern education and science. *The Advancement of Learning* (1605) and the Latin *Novum Organum* (1620) and landmarks in the progress of modern thought.

The reigns of James I. and Charles I. developed prose style further, and supplied writers as different as Sir Walter Raleigh (?1552-1618) and John Donne (1573-1631). There were yet others, varying from the uniqueness of Robert Burton (1577-1640) in the *Anatomy of Melancholy* (1621) to the occasional attraction of a hundred pamphleteers and sermon writers. Not wholly unlike Burton as a writer was Sir Thomas Browne (1605-82) whose popular *Religio Medici* reveals a broad and independent mind. The uncompromising rationalism and nominalism of Thomas Hobbes (1588-1679) expressed itself in *Leviathan*; the various wit of Cowley (1618-67) almost anticipated Addison in a 'middle style' of singular attraction; and Clarendon (1609-74), with defects which any school boy could point out, was about to raise English history from the mere chronicle which even Knolles (?1550-1610) had left it to that of a department fully equipped with style.

The purely poetic achievement of these fifty years is, however, the most remarkable. The extraordinary accomplishment of Spenser had called forth the two Fletchers, Giles (?1588-1623) and Phineas (1582-1650), first of all, at Cambridge; and then the younger poets William Browne (1591-?1643) and Wither (1588-1667), at Oxford. The great poetical achievement of the half-century, however, was the development of lyric verse. Many causes seem to have contributed to this—the universal love and practice of vocal music not the least of them. The severe and almost pedantic temper of Jonson produced some of the sweetest songs in the language; the strange mixture of mystical and sensual fire in Donne, though it never found perfect expression in a long piece gave some of the highest and strongest; and the example of both drew from others, in the reign of Charles especially—from Herrick (1591-1634) and Carew (?1594-?1639) to Lovelace (1618-58) and Suckling (1609-42)—an anthology of song-poetry which has been the delight and despair of all poetically-given persons since. Moreover, before the century had entered its second third, Milton appeared, and produced poetry which, except for the devo-

tees of the 'long poem,' contains practically in sample all his poetic gifts. *Comus* and *Lycidas* are not long, and *L'Allegro* and *Il Penseroso* are very short; the sonnets are but sonnets. But they had added by 1650 things worthy to rank in English poetry with the *Canterbury Tales* and with Spenser. *Paradise Lost* remains, not only the greatest English epic, but the highest expression of Puritan thought.

After the Restoration the great imaginative writers in prose and verse (those in drama had long pre-deceased them) die off, not to be replaced; and an age, at best of silver-gilt, at worst of brass, follows the age of gold. Fortunately the first generation is dominated and almost dictated to by one of the greatest figures in English literature. At the very beginning of it, John Dryden (1631-1700) strikes out a style of prose which is apt alike for rapier and sabre play, and adjustable to almost every use—save, perhaps, that of the highest imaginative work. The same consummate craftsman, after longer tentatives but showing his sight at the end almost at once, fashions a system of masterly couplet-verse which escapes almost entirely the monotony to which this style seems fated, and throbs with various life at every pulse. He is less fortunate in drama, but achieves no mean pattern of rhetorical-dramatic verse in his 'heroic' plays, and in the two great blank-verse tragedies of *All for Love* and *Don Sebastian*, while he does something to help the new comedy of manners, and in criticism earns distinction by his *Essay of Dramatic Poesy*.

Locke (1632-1704) in philosophy, Tillotson (1630-94) and others in sermon writing, and others elsewhere, extend the applications of the plain style in all departments of literature. Bunyan's *Pilgrim's Progress* is the last echo of mediæval allegory, but a perfect one. Meanwhile, nondescripts of the highest interest—Izaak Walton (1593-1683) in a style of simple beauty, Evelyn (1620-1706), North (1653-1734), and best of all, Pepys (1633-1703), in the intimate kinds of diary and memoir—diversify the scene.

In poetry proper there is hardly more than one such nondescript—Samuel Butler (1612-80)—to represent the genuine accomplishments of the time, though the greatest work of Milton actually falls within it. In serious drama something of the same disability hangs on the period. But in comedy Etherege (?1635-91), Wycherley (1640-1715), and later Congreve (1670-1729), Vanbrugh (?1664-1726) and Farquhar (1678-1707), by infusing the older styles of Fletcher and Jonson with the

spirit of Molière, and adding something new of their own, develop a kind of artificial comedy, saturated with wit, in language polished as it had never before been polished. Congreve's *The Way of the World* is the highest achievement of English comedy in prose.

A certain *degradation*, however, in the tendency of the period is particularly noticeable at its close. A heavy blow has been dealt on the moral side to the brilliant and artificial comedy just mentioned by Jeremy Collier (1650-1726), and on the literary side no fresh aspirants of great merit appear; while the state of prose is the worst of all. Nothing arrests the decay in drama—but in prose and verse, though no radical change is effected, three great writers come to the rescue.

In prose the great instrument of this rescue is the periodical essay, which, after long and slow change of form from the pamphlet, has been nearly got into shape by the eccentric and multiform energy of Defoe (?1661-1731). In the *Tailler* (1709-11), founded by Richard Steele (1672-1729), Swift (1667-1745) declares war against colloquialisms and slang. Steele himself and Addison (1672-1719), both in it, and still more in its successor the *Spectator* (1711-14), show how a vast variety of subjects may be treated in a style perfectly easy and familiar, yet in no sense vulgar. Swift, moreover, in *Gulliver's Travels* and in his other works shows how the plainest of plain styles can be raised by intensity of thought and especially by the seasoning of irony, to an instrument of almost terrible satiric power; while a little later Berkeley (1685-1753) displays its adaptability to philosophic purposes. Defoe once more did a deed to which there was no end by launching the adventure-novel in *Robinson Crusoe*, and the realistic novel in *Moll Flanders* and others of his latest works.

The rally of verse was even more significant, for it was in a twofold and widely diverging direction. Towards the end of the first decade Pope (1688-1744) took the Drydenian couplet in hand, smoothed the rhythm, sharpened the rhyme, confined the sense more rigidly than ever within the couplet, and in every possible way brought it up to a machine-like perfection. He made of this couplet a masterly means for the utterance of witty epigram. In expository (*The Essay on Criticism*) and still more in satiric (*The Rape of the Lock*) verse, for which this couplet is specially fitted, he reached a kind of 'farthest.' Meanwhile Prior brought the 'verse of society' to a perfection not wholly dissimilar, and gave a certain status to the

galloping anapaestic metre which had become popular in song.

Nearly twenty years before Pope's death, in 1726, however, appeared two poets who opened the first parallels against the fortress of couplet form with its garrison of prosaic sense. The first and greater of these was James Thomson (1700-48), with the blank verse—stiff, but strong and original—and the semi-Miltonic diction of his *Seasons*, the Spenserians of his *Castle of Indolence*, the attention to nature—the real nature—in both, and the dreamy poetry of the latter. The second was the weaker and more unequal genius of John Dyer (?1700-58), who in *Grongar Hill* not merely revived the irregularly poetic octosyllable of Milton, but looked on nature with an eye less certain but more poetic even than Thomson's own. These were followed by the too weak though well-willing muse of Shenstone (1714-63); the singular combination of Gray (1716-71), and the unique and not easily definable gift of Collins (1721-59). Gray's *Elegy Written in a Country Churchyard* has remained to this day one of the most popular poems in English. Finally, with the publication of *Tom Jones* (1749) by Henry Fielding (1707-54), the English novel became one of the most important divisions of our literature.

About the time of the accession of George III. to the throne, it might have seemed that another great change was coming—as it had come exactly a century before—in English literature. Macpherson's *Ossian* (1760-63), Percy's *Reliques* (1765), Hurd's *Letters on Chivalry* (1762), and Horace Walpole's *Castle of Otranto* (1764), were (within a period of but five years) the most prominent of many signs of a reaction in favor of those 'Gothic' times and that 'darkness' with which, since the Renaissance, men had agreed to stigmatize the middle ages. But it was not quite time; and a fresh reaction which kept things fortunately back, partly coincided with, and was even to some small extent caused by, the influence of one remarkable man.

The causes, character, and justice of Samuel Johnson's (1709-84) dictatorship are not to be even outlined in an article of this character. It indicates, if it did not actually determine during the last five-and-twenty years of his life, the orthodox literary character of English. The rhetoric and the persiflage of Goldsmith could never have found a more suitable medium than the verse of the day; it may be doubted whether the satiric realism of Crabbe (1754-1832) and the sorely-troubled gifts of Cowper (1731-1800) could have found a much

better. Blake (1757-1827) and Burns (1759-96) would have been Burns and Blake at any time. But in prose it was different. Johnson himself, Gibbon (1737-94), and Burke (1729-97) strove, without exactly reverting to the gorgeousness of the 17th century, to relieve the drabness of the early 18th. Except for the work of authors already mentioned (all of them save Crabbe and Blake to pass before the end of the century), English literature presents a sufficiently feeble spectacle between the death of Johnson, in 1784, and the appearance of the *Lyrical Ballads* in 1798.

But the tide, if it turned more slowly than at some other times, turned surely, and after the turn of the century itself rose ever faster and faster. Coleridge (1772-1834), hindered by fate and health, gave but little creative work, save at long intervals; but Wordsworth (1770-1850) held his way with the doggedness of his character as well as with the force of his genius; and one after another Scott (1771-1832), Byron (1788-1824), Shelley (1792-1822), Keats (1795-1821), in the higher, and many another in the lower, ranks of poetry, completed the romantic triumph. Byron, as satirist, wit, and an exponent of capricious humor has exasperated critics from his own day to this. But it is not easy to deny the genius of *Childe Harold's Pilgrimage* and *Don Juan*. As for Shelley, he left a group of immortal lyrics, uttered in a voice of such singular beauty as had not been heard since the days of the Elizabethans. Keats combined the classic purity of Greek art with all the strange new beauty of his romantic age.

Prose, a little later to show much change of style, became ever more abundant in quantity and more various in kind, the great divisions of the novel and the newspaper in its widest sense conquering, almost for the first time, a position as branches of literature proper. The achievements of the first thirty years of the 19th century are so enormous that, by a kind of paradox, they enforce more scanty treatment here than those of less prolific times. The fierce political controversies of the revolutionary time elicited a vigorous growth of political satire. Historians crowded to explore the past with as much as they could muster of the erudition and the grasp of Gibbon, and by the aid of the heightened, plain style which has been referred to. The enormous popularity of Sir Walter Scott multiplied the novel almost beyond bounds; and the essay in every form, whether critical or miscellaneous, gave employment to the pure and rather negative criticism of Jeffrey (1773-1850), the boisterous polygraphy of Wilson (1785-1854) and the quieter of De

Quincey (1785-1859), the exquisite but scarcely definable quality of Lamb (1775-1834), the less distinguished gossip of Leigh Hunt (1784-1859), the stately rhetoric of Landor (1775-1864), the unrivalled criticism, for criticism's sake, of Hazlitt (1778-1830). Worthy of mention, also, is the delicate work of Jane Austen (1775-1817) on the threshold of the 19th century.

The reign of William IV., and the beginning of that of Queen Victoria, saw the rising of new writers in every department of literature. The literature of the later 19th century has one almost unique advantage, in the extraordinarily long and well-maintained literary careers of at least some of its greatest exponents. Tennyson (1809-92), Browning (1812-89), and Ruskin (1819-1900) enjoyed a literary life of, the first more than, the other two all but, sixty years from their first work onwards.

In poetry, Tennyson produced in 1842 two volumes of excellence and variety of style. His friendly rival Browning for many years suffered from—and perhaps to some extent deserved—the reproach of obscurity, and even of harshness, though few have been greater masters of music. He is best remembered by *Pippa Passes* and *Dramatis Personae*.

A few years later than Tennyson's decisive appearance, an abortive 'break-away' from the Tennysonian style appeared in the so-called 'Spasmodic' school, and a sort of classical reaction—not quite so abortive—in the poetry of Matthew Arnold (1822-88); while, after yet another decade, a group of unusual power and influence arose representing something like the principles of the Pre-Raphaelite school in painting. This was headed by the painter Dante Gabriel Rossetti (1828-82); by William Morris (1834-96), a decorative artist and craftsman of remarkable gift, and an admirable poet and prose writer; and by Algernon Charles Swinburne (1837-1909), one of the greatest masters of rapid resonant versification that English ever possessed. Others were more or less closely associated with these, especially Rossetti's sister Christina (1830-94), whom some think the greatest of English poetesses; others accord this position to the more voluminous and versatile Elizabeth Barrett Browning (1806-61).

Not less remarkable was the prose fiction of the last century. The versatile talent of Bulwer Lytton (1803-73), the extraordinary humorous genius of Dickens (1812-70), and, more slowly developing, the searching criticism of life and power of creating character possessed

by Thackeray (1811-63), began to show themselves.

Group after group, and individual after individual followed—the shrewd observation and and psychological analysis of Marian Evans ('George Eliot') (1819-80), the borrowed romance combined with instinctive realism of the Brontës (Charlotte, 1816-55; Emily, 1818-48), the Christian socialism and vivid descriptive faculties of Charles Kingsley (1819-75), the middle-class and clerical dignitaries of Anthony Trollope (1815-82), the pictures of domestic life of Mrs. Oliphant (1828-97), the wide and eager interest in life of Charles Reade (1814-84), the historical romance of R. D. Blackmore (1825-1900), and the novel of crime, derived from France, of Wilkie Collins (1824-1889).

George Meredith (1828-1909) began to write when Dickens and Thackeray were at the height of their powers. His work, however, revolts against sentimentalism, and, by giving free rein to wit and irony, attempts to curb emotion; he sets up the Comic Spirit as an ideal observer of life to penetrate shams. *The Egoist* and *The Ordeal of Richard Feverel* are masterpieces. Samuel Butler (1835-1902), the satirist, fought against the stagnation of thought which was turning even science into an accepted conventional code. George Gissing (1857-1903) portrayed the squalor of poverty in great cities, and was 'one of the first English novelists to probe deeply the psychology of sex.' Finally, the greatest of these, Thomas Hardy (1840-1928) was in verse and novel the proclaimer of fate or destiny as the inexorable force that controls and shapes human life. His *Tess of the d'Urbervilles*, *The Return of the Native*, and *Jude the Obscure* have the firmness of structure of a Greek tragedy.

This continuance of creation was accompanied, when the century had reached nearly its last third, by a remarkable revival of criticism. Matthew Arnold, taking cue in part from the great French critic Sainte-Beuve, succeeded in awaking a real interest in it. Much earlier, too, the work of Ruskin tended in the same direction; and many brilliant critical writers in the later century, the chief of them John Addington Symonds (1840-93) and Walter Pater (1839-94), gave expression to the new criticism which took all arts more or less within its province. The great group of historians at the beginning—Mitford (1744-1827), Milman (1791-1868), Hallam (1777-1859), Roscoe (1753-1831), and others—passed with no real interval into a yet more brilliant one, which provided, earlier and later, more or less

meritorious practitioners in Grote (1794-1871) and Thirlwall (1797-1875), the historians of Greece, in Buckle (1821-62), Kinglake (1809-91), Freeman (1823-92), Green (1837-83), Lecky (1838-1903), Andrew Lang (1844-1912), Lytton Strachey, and men of letters of the first class in Carlyle (1795-1881), Macaulay (1800-59), and Froude (1818-94). Carlyle's interest in human life, assisted by his volcanic style, penetrated into almost all the regions of prose except that of prose fiction, and left remarkable results in them.

Davy (1778-1829), Darwin (1809-82), Hugh Miller (1802-56), Huxley (1825-95), and Robert Chambers (1802-71) as author of the *Vestiges of Creation* (1844), are instances of scientific subjects not interfering with literary form.

The growth of modern science has affected philosophy, once one of the main *ancillae* of literature, and, with other influences, has lessened the value if not the amount of the contributions of theology. But in the former division many writers have done well, and the chief of them, from the literary point of view, John Stuart Mill (1806-73) on one side of the eternal philosophical battle, and Henry Longueville Mansel (1820-71) on the other, deserve special mention; while the masters, in part at least, of the two, Jeremy Bentham (1748-1832) and Sir William Hamilton (1788-1856), if ranking above their disciples for originality, must rank far below them in expression. Herbert Spencer's (1820-1903) exposition of organic and social evolution had considerable influence. On the other hand, almost all competent opinion ranks the English of Cardinal Newman (1801-90) among the greatest examples of the literary language.

The decade preceding the close of the nineteenth century, with its cry of '*fin de siècle*,' foreshadowed the changes to come with the passing of the Victorian age. The catchwords 'art for art's sake' replaced what the opponents of the Victorian era designated 'art for sentimentality's sake.' Among the typical figures of the eighteen-nineties were: Oscar Wilde (1856-1900), aesthete and reviver of the comedy of manners; Max Beerbohm (b. 1872), essayist, caricaturist, and one of the most brilliant of the contributors to the *Yellow Book*; and George Moore (1852-1933), a follower of Emile Zola, who later turned to Balzac. The so-called *fin de siècle* group were strongly influenced by contemporary French literature, by Walter Pater, and by the Pre-Raphaelites.

The eighteen-nineties produced also a number of writers of various temperaments differing in various ways from one another and from

the 'art for art's sake' group. Rudyard Kipling (1865-1936) painted in verse and novel, India, the glory of the Empire, and the romance of modern industrialism. Another original and distinctive genius who first achieved recognition during these years is George Bernard Shaw (b. 1856). Shaw's literary career began with a series of brilliant dramatic criticisms in the *Saturday Review*. He became the chief advocate of Ibsen before the bar of English public opinion, and later attained even more fame for his socialistic views and his comedies with their searching criticism of modern life. William Henry Hudson (1862-1922) wrote romances and tales founded upon wild life in South America.

The increasing importance of London as the literary center of the English world during the 19th century makes anomalous any separate classification of Scottish writers. Robert Louis Stevenson (1850-94) was an essayist and writer of delightful romances. George Macdonald (1824-1905) and William Black (1841-98) are in the line of descent. In William Sharp ('Fiona Macleod') (1855-1905), the mysticism of the Celt finds fullest reflection. Sir James M. Barrie (1860-1937) is both novelist and dramatist. Nor must the Irish poets of the so-called Celtic renaissance be omitted. W. B. Yeats (1865-1928) was a poet of the mystical broodings of spirit. George W. Russell (1867-1935) was a mystic who regarded men as strayed heaven-dwellers. J. M. Synge (1871-1909) was the most important of the Celtic group, particularly in poetic prose-drama.

The twentieth century continued the emphasis upon the novel, but science in general and psychology in particular influenced it in subject matter and form. William de Morgan followed Dickens and Thackeray in manner, but was not typical. One of the most prolific writers, H. G. Wells (b. 1866), ventures upon prophecies concerning the future, his vivid imagination and scientific education combining to produce a new type of Utopian romance. In other novels he uses the framework of fiction within which to expound sociological doctrine, in yet others, he is a realistic reporter of life. Arnold Bennett (1867-1931) was a versatile and prolific writer, who portrayed the effects of an industrial age with humor and shrewd observance of character. John Galsworthy (1867-1933) was a realistic writer of fiction that deals with social and economic problems. *The Forsyte Saga* is generally regarded as the most complete panorama of the fortunes of a middle-class family during the period of transition from the reign of Victoria to the conse-

quences of the World War. Galsworthy won an almost equal fame as a dramatist, portraying forcefully the psychological and social conflicts of his day. Among other writers showing the new realism may be mentioned Hugh Walpole, Aldous Huxley, and D. H. Lawrence (d. 1930).

For a time science and realism together threatened to sweep away the last vestiges of romance, but Joseph Conrad (1857-1924) tinged realism with vivid colors and John Maschfield (1878), Poet Laureate and prose-writer, found the sea and the sordid underworld to be but provinces of romance. On the other hand, a new 'method' began to be obvious in the treatment of biography and found its way into literature in general. Strachey's *Queen Victoria* pointedly showed the new interest in the workings of the mind; most of the modern school are absorbed in the exploration of its depths and in expression of its 'stream of consciousness.' Virginia Woolf (1882-1941) is a brilliant example of this trend.

Poetry in the twentieth century has returned to the lyric for its finest utterance. Maschfield, Bridges, and Hardy have had great influence upon the work of the younger generation. An important factor in contemporary verse was the emotional crisis of the World War. Apart from the poetry inspired by experiences at the front, much modern verse has gone back to the simplicities and beauties of the English countryside for its themes. The more important of the present generation of poets are A. E. Housman (1859-1922); Stephen Phillips (1868-1915); Laurence Binyon (b. 1869); Alfred Noyes (b. 1880); Lascelles Abercrombie (d. 1938); W. H. Davies (b. 1870); James Elroy Flacker (1884-1915); Rupert Brooke (1887-1915), whose brilliant promise was ended by the war; Wilfred W. Gibson (b. 1878); John Drinkwater (d. 1937), author of the dramas *Abraham Lincoln* and *Robert E. Lee*, as well as of lyrics of English lanes and meadows; Ralph Hodgson; Walter de la Mare (b. 1873); Edward Thomas (1878-1917); Siegfried Sassoon (b. 1886); and J. C. Squire (b. 1884).

Such prominent dramatists as Barrie, Maschfield, Shaw, and Galsworthy have already been mentioned. Others who have contributed to the restoration of the drama as a literary art are Sir Arthur Wing Pinero (1855-1934), Henry Arthur Jones (1851-1929), Haddon Chambers (1860-1921), Granville Barker (b. 1877), St. John Hankin (1869-1909), Stanley Houghton (1881-1913), Githa Sowerby, H. H. Davies (1876-1917), Rudolf Besier (b. 1878), and A. A. Milne (b. 1882).

The best modern books on English literature

are Craik's *Compendious History of English Literature* and *Manual of English Literature*; Minto's *Manual of English Prose Literature*; Morley's *Library of English Literature* and *First Sketch of English Literature*; Taine's *History of English Literature* (trans. by Van Laun); Morley's *English Writers*; Ward's *English Poets*; Arnold's *Manual of English Literature*; Gosse's *Short History of English Literature*; Stopford Brooke's *History of Early English Literature*; Saintsbury's *Short History of English Literature*; Chambers' *Cyclopædia of English Literature*; Garnett and Gosse's *English Literature*; *The Cambridge History of English Literature* (14 vols., 1907-1917).

English River, another name for the Churchill River. It is also applied to an estuary in Delagoa Bay, Southeast Africa.

Engrailed, in heraldry, one of the 'ornamental' lines by which the ordinaries may be bounded, consists in a series of scallops with the points turned outwards.

Engraving, in the strictest sense of the word, is the art of scratching or incising marks or figures upon tablets of any hard substance. Certain forms of the art—such as decorative engraving upon metal, engraved writing upon tablets, and gem-engraving—are of extreme antiquity. In its more restricted sense, the word engraving is understood to designate the cutting or incising of designs upon metal plates or blocks of wood for the purpose of printing impressions from them. Engravings of this sort are divided into the two broad classes of engravings on metal, and engravings on wood. For the latter, see WOOD ENGRAVING.

The metals used are copper or steel, the latter chiefly for finer work. The plate, as the piece of metal is called, is first cut to the desired size, and its edges carefully bevelled off. It is then burnished and buffed till its surface is smooth and bright, being kept well oiled during the process.

The burnished plate is next freed from every trace of oil and thoroughly coated with a preparation known as an etching ground. There are different methods of 'laying' the ground. The plate is then smoked to desired darkness and cooled. The tracing having been satisfactorily transferred, strips of thick leather are fastened upon the borders of the plate to form supports for the straight edge against which the etching point is steadied while the textures are being etched. After the plate has been fully etched, all the blank parts are carefully varnished over, the supports removed and replaced by a border of wall wax—a mixture of bees-wax and Bur-

gundy pitch with a little tallow—and a corroding acid flowed over it until the lightest parts have been sufficiently affected. The plate is then dried, these parts also varnished, and the acid again applied. This is repeated until the deepest shadows are thought sufficiently bitten. When the biting is finished, the wall wax is taken off, and the plate washed. A rough proof is now pulled to enable the engraver to judge the effect of the biting: where the lights are too harsh, he may put on a little dry point etching (not bitten with the acid); where too gray, they may be lightened by burnishing. In making a line engraving, the design having been traced upon the plate, the engraver places the plate upon a sand bag, if small, or upon a movable palette, if large, and goes over the lines with a 'burin' or graver. This tool is made of hardened steel, four-sided, and is usually from two to four inches long. It is cut across at one end obliquely, and the extreme point is used to dig out the lines of the engraving, shallower or deeper, as the thickness of the line may require.

The plate being completed to the satisfaction of the engraver, it is first warmed, and is then covered with specially prepared ink by a dabber, thus insuring the filling of all lines of the engraving. The superfluous ink is next removed from the face of the plate with a piece of cloth, leaving the polished surface clean and bright and the lines of the engraving filled with ink. The plate is then put in a cylinder press and a dampened sheet of paper is laid upon it, with a further covering of soft material, and the whole is passed through the press. The paper is drawn away, and is found to bear upon its surface an exact reproduction of the lines of the engraving in ink, reversed of course, the ink having been taken up by the damp paper. The *print* (erroneously called 'engraving') is then dried and flattened under pressure.

The world's chief line-engravers have been Andrea Mantegna, M. Raimondi, Raffaello Morghen, Paul Toschi, Albert Dürer, Lucas van Leyden, Jean Duret, Jean Morin, and in England W. Faithorne, Sir Robert Strange, W. Woollett, W. Sharp, W. Blake, W. Miller, G. T. Doo, Lamb Stocks, and C. H. Jeans. In America the names of Asher B. Durand, Joseph Andrews, James Smillie, his son, James D. Smillie, J. W. Casilaer, Alfred Jones, Charles Burt, and William E. Marshall may be mentioned. The great period of wood engraving was that of 'the sixties,' as it has been styled, when the Dalziel brothers engraved the work of Millais, Rossetti, and other supreme artists in black and white. (See Gleeson White's

Books of the 'Sixties.) For a bibliography of works on engraving see Wilshire's *Introduction to the Study and Collection of Ancient Prints* (2d ed. 1877).

Engrossing was regarded as a grave social offence during the middle ages. It consisted in buying in large quantities, so as to be able to control the market. The offence was not formally abolished in Great Britain till 1844. Engrossing is also the term applied to the writing out of legal and other documents and records in a prescribed form for preservation.

Enharmonic, a term in music applied to intervals smaller than a semitone. It is also given to a form of modulation in which certain notes receive other names than those by which they were described in the key used before the modulation.

Enneking, John Joseph (1841-1916), American painter, born at Minster, O., established his studio at Boston, Mass., where his New England landscapes and figure pieces became very popular.

Ennemoser, Joseph (1787-1854), Austrian writer on medicine and philosophy, practised his profession at Munich, where he became noted for his advocacy of hypnotism as a method of medical treatment.

Ennius, Quintus (239-169 B.C.), Roman poet, was born at Rudiae in Calabria, and was by birth a Greek, but a subject of Rome. In 204 B.C. he was taken to Rome by Cato. He was always regarded by the Romans as the father of their poetry, and Cicero ranks him as their chief epic poet. Only fragments of his work remain. His chief work was his *Annals of Rome*, written in hexameter verse.

Enoch (Heb. *Hanokh*), the name of four individuals in Scripture history—a grandson of Abraham; a son of Reuben; a son of Cain, who built the city called Enoch; and the son of Jared, the seventh from Adam, who lived 365 years.

Enoch, The Book of, an apocalyptic work purporting to give the revelations made to Enoch, the son of Jared, both before and after his translation.

Enoch, The Book of the Secrets of, a long-lost apocalyptic work recently brought to light in a Slavonic version, and hence called also the Slavonic Enoch, to distinguish it from the above (the Ethiopic). Its original language was Greek. See W. R. Morfill and R. H. Charles's *The Book of the Secrets of Enoch* (1896); Bonwetsch's *Das Slavische Henochbuch* (1896).

Enriquez Gomez, Antonio (fl. 1640-50), Spanish man of letters, Segovian, of Jewish

descent, who wrote novels in the picaresque style. His best-known work is *El Siglo Pitagorico*, published in 1647. See Ticknor's *History of Spanish Literature* (1849).

Ensiform Appendix, or E. Cartilage, the lowest segment of the sternum or breast bone.

Ensign. (1.) The lowest grade of commissioned officer of the line or executive branch in the United States navy and in the navies of some other powers. (2.) The national flag which is flown by a vessel at her gaff or flag-staff.

Ensilage, or Silage, is green forage closely packed and preserved under pressure in air-tight structures called silos. The purpose of the silo in its present form is to exclude the air from the stored forage and in order that this may be more effectively done to put the material under pressure by its own weight. When the making of ensilage was begun about a century ago in Europe the material was frequently stored in pits or underground silos, but at present only above-ground structures are used. The preparation of ensilage was introduced into the United States about 1875. Most any crop which furnishes abundant succulent material when in the green state can profitably be made into ensilage. Ensilage crops require the same care and cultural treatment as other field crops, and it is in fact a common practice to use corn from the general crop for ensilage instead of growing a special field for the purpose. Consult U. S. Dept. Agr. *Farmers' Bul.*

Enstatite is a mineral which belongs to the group of pyroxenes, and crystallizes in the ortho-rhombic system. It is a silicate of magnesium and iron, and differs from bronzite and hypersthene in containing a smaller percentage of iron oxide.

Entablature, in architecture that part of a structure which is immediately above the column; also the distinguishing feature of the Greek styles. The height of the entablature is one-fourth of the column of the order.

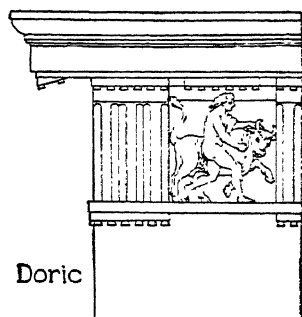
Entail, a conveyance or settlement of land by which the course of descent is restricted to a specified class of heirs.

Enteritis, inflammation of the intestine, which may occur apart from any other disease, or may be merely an accompaniment of such fevers as typhoid and cholera.

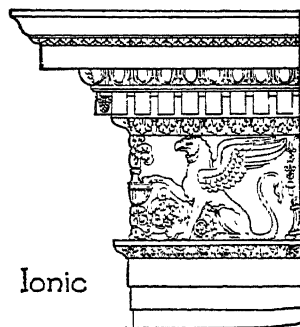
Entomological Society, American. A scientific association for the study of insects, founded in 1859 and incorporated in 1826.

Entomology, the science which treats of insects in the most general sense. Under the head of INSECTS will be found a scientific account of that most interesting group of animals. For the

practical entomologist an insect is apt to mean not only an animal of fair size, but one capable of being preserved in the dry state without excessive loss of shape or beauty. In consequence, the butterflies, moths and beetles claim most attention, while the flies and other softer-bodied insects are greatly neglected. For field-work some form of net is the first necessity; for killing insects when obtained, a poison-bottle containing a preparation of cyanide of potassium and plaster of Paris is most com-



Doric



Ionic

Greek Entablatures.

monly used; the next process is the more difficult one of 'setting' the insects. A sufficient interval is allowed after death, in order that the tissues may relax, and the insect is then fixed by means of a pin through the body to the setting-board. This is a strip of wood covered with cork, having down the center a groove corresponding generally in size to the body of the insect. The body of the insect is placed within the groove, and, in the case of large, strong-winged specimens, by means of fine entomological pins. In doing this it is important that the characteristic features of the insect should be as fully displayed as possible. The insects are now placed in the cabinet, which should be well supplied with some in

secticide, and should be kept in a dry place.

Most text-books of entomology and manuals of taxidermy and zoological collecting (as W. T. Hornaday's) give directions for collecting and preserving insects in several ways. See also A. S. Packard, *Text-book of Entomology* (1898), and *Guide to Study of Insects* (1880); and L. O. Howard, *The Insect Book* (1901).

Entomostraca, a sub-class of the Crustacea, which includes all the lower and simpler forms, such as barnacles and copepods.

Entre Douro e Minho, former prov. of Portugal. The principal products are grain, fruits, wine, cattle, textiles, etc. It is the most densely peopled portion. Chief town, Oporto; p. 1,304,353.

Entrenchment, in its roughest form, is a trench with the earth piled up in front to form a parapet; used not only in the defence of a position, but also by troops advancing to the attack. See *Manual of Military Field Engineering*, by Major Beach (Kansas City, 1902).

Entre Rios, prov., Argentine Republic, occupying the angle between the Parana and the Uruguay rivers. The cap. is Parana; p. 425,373.

Entresol, a low story in the middle of a secular building measuring exactly one-half of the upper and lower stories.

Entropion, or **Entropium**, a condition of the eyelids in which the lashes are turned inwards upon the eye (trichiasis), so as to cause constant irritation, which may end in ulceration.

Entropy, in thermodynamics, a quantity whose change, as the working substance passes from one state to another differing slightly from it, is measured by the ratio of the heat which has been taken by the substance to the absolute temperature of the source which has supplied this heat.

Entwistle, James (1837-1910), American naval officer. Was born at Paterson, N. J., and took service in the U. S. navy as engineer in 1861, being commissioned lieutenant in 1866. He served under Farragut in the Civil War, and in the battle of Manila, May 1, 1898, under Dewey, receiving high commendation. He was promoted rear-admiral in 1899, and retired.

Envelope, a form of curve. A curve is most simply generated by the movement of a point; but it may also be generated by the movement of a line, whether straight or curved. If this line, in its different positions, be looked on as a family of lines, then the envelope is a curve

touching each consecutive intersecting member of the family.

Environment, a word which has been extensively used in the many discussions of evolutionary problems which have taken place since the publication (1859) of Darwin's *Origin of Species*. The word environment includes not only the physical conditions of existence, but also—a matter probably of greater importance—that part of the surroundings which is made up of other living organisms. See EVOLUTION.

Envoy. See **Diplomatic Service**.

Enzyme is a ferment present in digestive juices which renders food substances soluble. Enzymes act as catalytic agents, as pepsin.

Eocene, in geology, is the oldest of the three great systems into which Lyell proposed to subdivide the Tertiary or Cainozoic series. But his Eocene is now recognized as containing at least two distinct members—an older, or Eocene proper, and a newer, named Oligocene by Beyrich. The Eocene itself has still more recently been broken up into the Palaeocene, or early Eocene, and the Eocene. The Eocene follows the Cretaceous though not without a gap. The orogenetic disturbances by which the earlier chalk was exposed to erosion probably continued through the whole of Eocene and Oligocene times, and culminated in the final upheaval of the Alps and the mountain ranges of S. Europe and Central Asia.

The strata of this age in the Paris basin can be closely correlated with those of London, and there is no reason to doubt that they were at one time continuous, and have been subsequently separated by upheaval, folding, and the encroachment of the sea.

The Eocene strata of the south of Europe are of quite a different type. In previous geological epochs a great and deep Mediterranean sea had existed in that quarter (see CRETACEOUS SYSTEM), and this continued through the Eocene. Massive limestones accumulated in these warm enclosed waters, and the dominant organisms of these rocks are gigantic Foraminifera of the genus Nummulites. This great limestone is a truly marine formation, crowded with corals, molluscs, and echinoderms. In the Northern Alps the Eocene contains the problematical 'flysch,' a thick sandstone with large transported blocks and comparatively unfossiliferous. In N. America a third facies of the Eocene is developed. It was a continental epoch in this region, and was characterized by the existence of considerable land masses, in the interior of which large sheets of fresh water were formed. In them de-

posits of sand and clay gathered, mixed with fresh-water shells and the remains of plant and land animals. These lakes were only temporary. The total thickness of these fresh-water deposits mounts up to from ten to twelve thousand feet. The orange, yellow, red, and brown sands and clays cover extensive areas, and lie in gently sloping beds which have been carved by rain and streams into fantastic forms. This is the region to which the early pioneers gave the name of *mauvaises terres*, and it is still known as the Bad Lands. The rocks there have yielded magnificent collections of extinct vertebrates.

It is from the beginning of the Eocene onward that mammals become the dominant race, and they are mostly of the placental group which preponderates at the present day. Though some of the Eocene mammals were of great size, their brains were invariably small, so that they were probably of sluggish habits and possessed little intelligence. Among the more remarkable of these Eocene mammals may be mentioned *Dinoceras*, *Uintatherium*, *Coryphodon*, *Phenacodus*. The Creodonts were primitive carnivores, the Zeuglodonts the Eocene representatives of the whales. The Eocene molluscs have quite a modern aspect, and from this time forward the forms of life gradually approximate more and more closely to those which now inhabit the earth. See S. V. Wood's *Eocene Mollusca* (1861-71); J. Starkie Gardner's *Eocene Flora* (1879-84); E. D. Cope's *Tertiary Vertebrata*, U. S. Geol. Surv. of the Territories (1884); W. B. Clark, *Bulletins* 83 and 141, U. S. Geol. Surv. (1892, 1896).

Eolian Deposits. In arid regions and along sandy shores the wind is an important transporting agent for all small fragments. Older deposits of these kinds give difficulty in interpretation. They are all clastic rocks and in one of the classifications the name *anemoclastic* has been very appropriately given to them.

Eon de Beaumont, Charles Geneviève Louis A. A. T. d' (1728-1810), usually known as the Chevalier d'Eon, born at Tonnerre, who for a large part of his life, especially from 1777 to his death, persisted in wearing woman's dress. He was a trusted agent of Louis xv. in the discreditable secret diplomacy which he carried on behind the backs of his acknowledged ministers. He subsequently served Louis xv. in England (1762-5), where he became at last fully accredited minister. His disgrace came, unexpectedly and still inexplicably, in 1765. See Telfer's *Chevalier d'Eon*

de Beaumont 1885, and Homburg and Jousse-
lin's *Le Chevalier d'Eon* (1904).

Eos, in Greek mythology, the goddess of the dawn, corresponding to the Latin Aurora.

Eosin is tetra bromfluorescein, $\text{OC}(\text{C}_6\text{H}_4\text{CO})(\text{C}_6\text{H}_4\text{Br})_2\text{OI}$, and is a red solid that forms a fluorescent scarlet solution.

Eötvös, Jozsef, Baron (1813-71), Hungarian novelist and statesman, was born at Budapest. His novel, *The Carthusian* (1838-41; Ger. trans. 8th ed. 1890) established his reputation at home and abroad. He championed political reform, including the emancipation of the Jews, in the newspaper press, and in 1848 he became minister of public instruction in the first responsible Hungarian ministry. He was a brilliant orator, his academic memoirs of famous writers (ed. 1868) ranking high as literature.

Eozoon. Among the ancient crystalline gneisses and schists of Canada masses of serpentinous limestone occur which possess a peculiar structure, the origin of which has given rise to much controversy. Further investigations have shown that eozoon is found in the baked and recrystallized limestone blocks which are thrown out of the crater of Vesuvius, and occurs also in limestones which have been altered by the heat of masses of intrusive igneous rock.

Epacris, a genus of Australasian heathlike shrubs, cultivated as winter-flowering plants, bearing spikes of small auxiliary flowers, often brightly colored.

Epact. See *Calendar*.

Epaminondas (c. 420 to 362 B.C.), general and statesman of Thebes in ancient Greece. In 362, in the course of his last expedition into the Peloponnesus, he routed the Spartans and their allies at Mantinea in Arcadia, but himself fell in pursuing the foe. Epaminondas revolutionized military tactics. As a statesman, he raised Boeotia for a short period to be the leading state in Greece; but he failed to unite the Boeotian towns to Thebes. He lived and died poor. He was an ardent student of philosophy, and in culture generally, and especially in oratory, was far above his countrymen.

Epaulets, Military. In the United States army epaulets are worn only by general officers when on dismounted duty in full dress uniform. Epaulets are made of gold after a sealed pattern in the office of the quartermaster-general, and have a solid crescent. The only device is the United States coat-of-arms embroidered in gold, and placed in the center of the crescent.

Epaulets, Naval. All commissioned officers

of the U. S. navy—except chief boatswains, chief gunners, and chief carpenters—wear epaulets when in dress or full-dress uniform. The epaulet is composed of the strap, the crescent, the bullion, and the rank and corps devices. Some of the devices are of silver, but the others and the remainder of the epaulet are of gold.

Epée, Charles Michel, Abbé de l' (1712-89), founder of the French system of educating deaf mutes by means of signs, the manual alphabet, and writing. In 1784 he published his *True Manner of Educating the Deaf and Dumb*.

Ephah, a Hebrew measure of capacity, approximately equal to a bushel; the *bath* was its equivalent for liquids.

Ephesus, the designation of youths at Athens in ancient Greece after they had attained the age of eighteen years. They retained this title and status for two years, at the expiration of which they were enrolled as full citizens.

Ephemera, *May-fly*, an insect belonging to the order Neuroptera, very short-lived in adult life, but having a larval existence of about two years. See L. O. Howard, *The Insect Book* (1901).

Ephesians, Epistle to the, a letter bearing the name of the apostle Paul, and believed to have been written by him during his imprisonment in Rome, *c.* 60-65 A.D. The remarkable parallelism of thought and language that subsists between Ephesians and Colossians (see reference Bibles) is generally explained on the hypothesis that the former was written immediately after the latter, but has induced many scholars to deny the Pauline authorship of Ephesians. See *Commentaries* by Macpherson (1892), Moule (Cambridge Bible, 1886), Agar Beet (1890), Von Soden (1891), Wohlenberg (1895), Abbott (Int. Crit. Com., 1897); and *Introductions to the N. T.* by M. Dods, Jülicher (4th ed. 1900), B. W. Bacon (1900), and others.

Ephesus was the chief of the twelve Ionian colonies from ancient Greece which were founded on the w. coast of Asia Minor. It stood on the Cayster, near its mouth, and was built probably about the 11th century B.C. It soon enjoyed great prosperity. With the rest of Ionia, Ephesus was subject in turn to the Lydian king Croesus (560 B.C.), to the Persians (479-387 B.C.), to Athens, to the Macedonians, and to the Romans. It was especially famous for its worship and temple of Artemis (Diana), the great nature-goddess of Asia.

Ephod, a Hebrew word applied to two very dissimilar objects: (1) an article of the high

priest's dress, also worn by temple servants, and (2) some kind of image. The garment was a sort of tunic, woven of variously-colored linen, ornamented with gold thread, and held in place by two shoulder-straps, which were surmounted by a pair of onyx stones bearing the names of the twelve tribes of Israel—six upon each. Over the front of it hung the breast-plate, containing the Urim and Thummim. About the ephod as an image little is known.

Ephori, or **Ephors**, the chief magistrates of Sparta in ancient Greece. They were five in number, and are said to have been first appointed in the 8th century B.C. It was during the next century that they gained their political power. Two ephors always accompanied the kings on expeditions; they could indict the kings and summon them before them; they also became the supreme civil court in the state, and were charged with the maintenance of the strict Spartan discipline. The ephoralty was overthrown by the reforming king, Cleomenes III., who reigned from 236 to 222 B.C.

Ephraem Syrus, called 'the prophet of the Syrians,' a prolific theological writer. His asceticism and his fervid preaching earned him a great reputation. Canonized as a 'saint,' his day in the Greek Church is the 28th January; in the Roman, the 1st February. His opinions were Athanasian in the main, but with a decided tendency to Monophysitism.

Ephraim, the younger son of Joseph, and brother of Manasseh, who, having been adopted by Jacob, became the founder of one of the twelve tribes. The territory of Ephraim lay in the middle of Canaan. The Ephraimites were an ambitious and powerful tribe (Judg. 8:1-3), and always jealous of the preponderating influence of Judah, took the hegemony of the ten northern tribes after the revolt under Rehoboam, so that the name Ephraim is often used as equivalent to Israel.

Ephrata, bor., Lancaster co., Pa., 19 m. s.w. of Reading, on the Phila. and Read. R.R. It was the seat of the Ephrata community, notable as having had a longer existence than any other American communistic society. The 'Brother-house' and 'Sister-house' still stand, and are often visited by those interested in socialistic experiments; p. 6, 199.

Epiblast. See **Embryology**.

Epic. In modern literature and criticism epic is a term applied to heroic poetry, of sustained length, whether sacred, as in Milton, or profane, as in Homer, Virgil, Tasso, Voltaire (the *Henriade*). In a period of confirmed literary habits, the author of an epic (say Virgil)

aims at being read. In earlier periods, whether the author did or did not write his poem, his audience was mainly reached by recitation. The endless literary controversy about the epic arises from the problem of the Homeric poems, especially the *Odyssey* and the *Iliad*. The Greeks of the literary age themselves knew nothing about either the age or the personal history of the author of these epics, who was known as Homer. Charles Perrault, the author of the fairy tales (1697), alluded to a theory that there never was a Homer; the epics are only a compilation of short songs by various authors. In 1795, Wolf published, at Halle, his *Prolegomena*, the beginning of real destructive criticism of Homeric unity. He decided that there was no primitive written text: the poems were lays orally recited. For a defense of Homeric unity, see Colonel Mure's *Critical History of the Literature of Ancient Greece* (2d ed. 1859), and Mr. Andrew Lang's *Homer and the Epic* (1893).

Another famous national epic is the German *Nibelungenlied*. It is catholic and mediæval, whereas the legendary persons and events of which it treats were neither. The strophe used was a novelty in narrative poetry. The poem is a mediæval South German poem, in which legends also known to the Scandinavians (*Volunga Saga*) are modernized, catholicized and to a great extent spoiled.

The French *Song of Roland* (11th century) recounts romantically an historic event of 778 A.D. Its maker handled materials (extant in tradition and in ballads) in a free, artistic spirit (see Léon Gautier, *Epopées Françaises*, 2d ed. 1878-82). *Beowulf* is a Christianized Old English poem on early heathen data.

The Indian epics, *Rāmāyana* and *Mahābhārata*, are doubtless composite things of various dates and authorships, but they have none of the Homeric unity and concentration. Thus the nearest approach to the Homeric epic is the French *Song of Roland*, and the other *chansons de geste* of early date—a literature national, spirited, and martial, written, but written with an eye to recitation. Finally, the two Homeric epics became the model of men of letters—Apollonius, Rhodius, Quintus Smyrnaeus, Virgil, Milton, and others less eminent. 'Rules' were extracted from Homeric practice, especially by the critics of the ages of Anne and Louis XIV. The rules did not produce good epic poets.

Epicharmus (about 540 to 450 B.C.), the chief Dorian comic poet in ancient Greece, gave a new development to comedy by taking his subjects largely from the ancient mytholo-

gy, and constructing a regular plot, in place of the previous buffoonery which characterized the Megarian drama. None of his works have been preserved entire, though numerous fragments survive, which will be found in Lorenz's *Leben und Schriften des Epicharmos* (1864), or Kaibel's *Comic. Græc. Fragmenta* (1890).

Epictetus, the famous Stoic philosopher, was a native of Hierapolis in Phrygia. His teaching is known to us only from the notes preserved by his devoted pupil Arrian, known as the *Encheiridion* or 'Handbook,' and the *Discourses*. Reason is our guide; what accords with it is pleasing to God; our conscience must be obeyed. An edition of Arrian's work on Epictetus was published by Schenkl (1894; Eng. trans. by Higginson, 1865, and by Long, 1903). See also C. H. S. Davis's *Greek. . . Stoicism: Epictetus* (1903).

Epicureanism, one of the two great ethical philosophies which arose at Athens at the close of the 4th century B.C. (shortly after the death of Aristotle), and so called after its founder, Epicurus. His hedonism differed widely from the earlier and cruder hedonism of the Cyrenaics, and is quite misrepresented by the popular meaning of the adjective 'epicurean.'

The pleasure which was for Epicurus the true good was the tranquillity of mind and freedom from want and pain which come from self-control and simplicity of life. As an aid to this life of simple and tranquil enjoyment, Epicurus highly valued the company of friends. See W. Wallace's *Epicureanism* (1880); also Pater's *Marius the Epicurean* (1892).

Epicurus (342 to 270 B.C.), Greek philosopher, founder of the Epicurean school, was an Athenian citizen, though born in the island of Samos. He went to Athens in 323 B.C., but soon removed to Colophon, where his father was teaching, in which he also joined, and later followed the same occupation at Mytilene and Lampsacus. In 306 he returned to Athens and bought his celebrated gardens in the center of the city, and there established his school and spent the remainder of his life. He kept aloof from politics, following his favorite maxim, 'Live unseen and unknown.' See Kreibitz's *Epikuros* (1886).

Epicycle, in the Ptolemaic astronomy, a small circle along the circumference of which a heavenly body moved uniformly, while the center of the same circle travelled round a larger circle called the 'deferent.'

Epidaurus, a town in Argolis, in ancient Greece. It was especially famous for its temple of Æsculapius, to which invalids flocked from the whole of Greece. Excavations here have re-

vealed interesting temples and a perfect Greek Theatre. See Caton's *Epidaurus* (1900); Cavvadias's *Fouilles d'Epidaure* (1893); Defrasse and Lechat's *Epidaure* (1895).

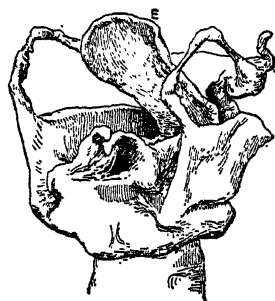
Epidemic, the term used for those diseases which suddenly, through infection, assume wide-spread prevalence. The Great Plague of London (1663-5), and the Black Death (1348), from which Boccaccio's characters were supposed to be flying, are historic examples.

Epidendrum, a large genus of epiphytal orchids of wide geographical distribution, mostly bearers of small inconspicuous flowers. See Bailey's *Cyclopedia of Am. Horticulture*.

Epidote is a mineral which occurs frequently in crystalline schists and weathered igneous rock. It is a silicate of lime and alumina (containing also small quantities of iron oxide and other ingredients), and crystallizes in the monoclinic system. Epidote is sometimes of gem quality. It is usually black or dark green and in thin sections, varies from colorless to clear pale green or yellowish green, and is somewhat dichroic.

Epigastrium, one of the nine artificial divisions of the abdomen or belly, defined by anatomists, for convenience in description and localization. It contains the greater part of the stomach, the pancreas, and the left lobe of the liver.

Epiglottis, the thin leaflike fibro-cartilage which is attached to the back of the tongue, in front of the windpipe.



Epiglottis (E) and Adjacent Parts.

Epigoni in ancient Greek story, the sons of the seven heroes who perished in attempting to take Thebes.

Epigram, originally applied to the writing engraved on a monument or the pedestal of a statue; but it was soon extended to include all individual sayings marked by the pointed conciseness characteristic of such inscriptions. Of this nature are the epigrams in the Greek

anthology. But the idea of satire soon crept in, and in the epigrams of Martial and Catullus became almost the sole motive for their production. The writings of Voltaire, Heine, and the *Satires* of Pope often consist of mere strings of biting epigrams. The *Xenient*, produced by Goethe and Schiller, is a well-known collection of epigrams on art; and Spain has a large store of epigrams in the works of Argensola, Iriarte, and Campoamor.

Epigraphy, the science which treats of the study, decipherment, and interpretation of inscriptions.

Epilepsy, a disorder, the essential symptom of which is a recurring, abrupt loss or alteration of consciousness; includes many types of seizures—convulsions, vertigoes, emotional explosions, irritable periods and psychic clouding.

The facts pertaining to heredity have not been established sufficiently to formulate laws regarding the transmission of epilepsy. The majority of epilepsies seem due to multiple factors—to various organic injuries and inferiorities. The immediate cause of epilepsy is cerebral vascular disturbance with resulting nutritive upset and transitory oedema of parts of the brain. This may be caused by abnormal activities of endocrines, various toxic conditions such as encephalitis, brain tumor, arteriosclerosis, and a variety of other conditions. Research has thus far failed to isolate perversions of function or organs peculiar to epilepsies. Therefore, no drug is a specific remedy. Reports from England in 1942 showed that epileptic attacks did not increase when air raids were expected, thus bearing out the theory that epilepsy is physical and so not to be confused with the psychoneuroses.

Epilobium, a genus of hardy perennial herbaceous plants belonging to the Onagraceæ. They are called 'willow-herbs,' and have a four-cleft calyx, four petals, eight stamens, and a long four-celled capsule.

Epilogue, a short speech addressed to the audience by one of the actors of a piece, bespeaking their indulgence for the author and the players.

Epimenides, a Cretan prophet and poet, who is said to have visited Athens about 596 B.C. to purify the city in consequence of a plague which was ravaging it.

Epimetheus, in ancient Greek legend, was a son of the Titan Iapetus and Clymene, and a brother of Prometheus.

Epinal, capital of dep. Vosges, France, on the Moselle; brewing, weaving, and printing are the chief industries. The library contains many old mss., including the *Epinal Glossary*

of Anglo-Saxon and Old Saxon words; p. 28,080.

Epinay, Louise Florence Pétronille Tardieu d'Esclavelles, Marquise d' (1726-83). French authoress, and mistress of Grimm and Rousseau, for the latter of whom she built the Hermitage. She was born at Valenciennes. Her literary work included *Conversations d'Emilie* (1781), and *Mémoires et Correspondence* (1818; Eng. trans. 1897).

Epiphanius, a learned theologist, was born of Hebrew parents in Palestine c. 315 A.D. He became a leading spirit in the growing movement towards asceticism, and vigorously opposed the Gnostic and Origenistic speculations. He died in 403, leaving behind a work entitled *Panarion*, a treatise against heresy, which is a valuable source for the theology of the time.

Epiphany, a church festival intended to commemorate the manifestation of Christ. It falls on January 6, on which date the Eastern Church in the 4th century celebrated the baptism and birth of Jesus. About the same period the Western Church observed the feast of the Nativity on December 25. By the next century the western custom had spread to the east, and the eastern to the west, so that, while December 25 came to be universally observed as the day of Nativity, the feast of January 6, twelve days after, was retained as the Epiphany.

Epiphyllum, a genus of handsome climbing Brazilian plants belonging to the Cactaceæ.

Epiphytes, plants which grow upon the surface of other plants, have no direct connection with the soil, and do not obtain nutriment, as do parasites, from the growing tissues and sap of the host plant. Many derive much nutriment from the decaying bark about their roots; others use their hosts merely as means of attachment. Many mosses belong to the class of epiphytes.

Epirus, a country of ancient Greece, was bounded by Thessaly and Macedonia on the e., Illyria on the n., and the Ionian Sea on the w. The Molossian princes eventually extended their rule over all Epirus. It was conquered by the Romans in 168 B.C. The name Epirus is sometimes used in modern geography for the s.w. portion of the Turkish province of Janina.

Episceæ, a genus of tropical plants belonging to the Gesneraceæ, mostly natives of the West Indies and Central America.

Episcopacy. The government of a church by bishops does not necessarily imply the doctrine of apostolic succession. But the Anglican,

as well as the Roman and Eastern Churches, require as an essential of a valid ministry that all their clergy shall be ordained by bishops, who have themselves been consecrated by bishops—thus carrying back the chain in alleged unbroken continuity to the apostles of Jesus Christ. The administrative powers accorded to bishops have differed at various times, and still differ in various churches. In the ancient Celtic Church the bishops appear to have had neither jurisdiction nor diocese. But their spiritual functions have been always the same. To them alone belong the rights of ordination and confirmation. In the Anglican Church there are both diocesan and suffragan bishops, and also missionary bishops. No bishop is permitted to perform episcopal functions within the diocese or sphere of another without his consent.

Episcopal Theological School in Cambridge. A divinity school of the Episcopal Church in Cambridge, Mass., founded in 1867. The course of three years leads to the degree of B.D.

Episcopus, Simon (1583-1643), whose real name was BISSCHOP, Dutch theologian, after the death of Arminius, the head of the Arminian party; was born at Amsterdam. When Gomarus died, 1612, Episcopus was called to his chair at the Leyden University, an appointment which brought forth vehement protests from the Calvinistic side; the synod ejected him and sentenced him to banishment; but in 1626 he returned to a pastorate in Rotterdam, afterwards becoming rector of the Remonstrant College at Amsterdam, where he died in 1643. It was Episcopus rather than Arminius who gave the sect its theology, which he set forth in his *Confessio* (1621) with its *Apologia* (1629), and his unfinished *Institutiones Theologicæ*.

Epistemology (theory of knowledge), a term introduced to denote a philosophical discipline which studies the nature and validity of knowledge, but is distinguished from psychology and from logic.

Epistle primarily means nothing more than a letter. But the custom of preserving and publishing letters naturally led to writing them with a deliberate eye to publication. When letters were written in verse instead of prose they grew more and more into a definite form of literature. The epistles of Lucilius were satiric, those of Horace mainly didactic. Ovid used the epistle as a form of elegy. Of Renaissance epistles, characteristic examples may be found in the verse *Letters* of Donne; and in the poems of Samuel Daniel, Michael Dray-

ton, and others. But except in isolated instances, the epistle has played no important part in later poetry.

Epistles, The Biblical. Distinguishing between the epistle or literary letter and the true letter, we find that the authentic epistles of Paul fall under the latter heading. Of the other New Testament epistles, the three of John and 1 Peter may be classed as letters; the rest are obviously epistles, homilies in letter form. The best example of the letter in the Old Testament is the so-called Epistle of Jeremiah.

Epistolæ Obscurorum Virorum, a satire aimed at the Rhenish monks and opponents of the reformer Reuchlin, consisting of pretended letters from the clerics themselves, in which their credulity and ignorance are exposed in broadly humorous fashion.

Epitaph, an inscription on a tombstone commemorating the deceased, or an inscription suitable for such a commemoration. In this, as in so many literary genres, Greece supplies the earliest and most perfect examples, as epitaphs in the Greek anthology, or on the Lacedæmonian dead at Thermopylæ. Ben Jonson and Herrick remain supreme in the art of English poetical epitaph; Milton's lines on Shakespeare are still unequalled; Pope wrote some memorable inscriptions; and Tenneyson's epitaphs rank high. In the New England churchyards many interesting epitaphs are to be found, and these often are important adjuncts to genealogical study.

Epithalamium, a song sung in honor of a newly wedded pair. The great *Epithalamium* of Spenser is one of the glories of English literature.

Epithelioma, a cancer formed of proliferating epithelial cells; the common form of cancer in the lip and tongue. See **CANCER**.

Epithelium. Epithelial cells vary according to their situation and function. Where their main office is protection, they are flat, nucleated scales of irregular shape. On the respiratory mucous membrane the epithelial cells are characterized by the possession of cilia. The rapid movement of these cilia in one direction, followed by slow relaxation, constantly drives the superincumbent fluid along a definite route. Epithelial cells of highly specialized type form the secretory apparatus of many glands of the body: the enamel of the teeth, the lens of the eye, the hair, horns, and hoofs of mammals, as well as the secretory cells of organs such as the kidneys, are alike epithelial in origin.

Epizoa, a division of the crustacean group

Copepoda, including forms characterized by their parasitic habit.

Epoch, an astronomical term denoting a fixed date arbitrarily chosen as a starting-point for the calculation of celestial movements. The moment of perihelion or periastron passage is the zero point in time assumed for comets and binary stars respectively; while the epoch or a variable star, generally given in Julian days, is some definite light-phase, onward from which the period is reckoned.

Epode was a designation given by the ancient Greeks to the concluding portion of a choric song. The term is also used for the shorter verse of a couplet which forms a sort of echo to the longer one, as the pentameter does to the hexameter in the elegiac couplet.

Eponym, a term applied to the fictitious founder of a race whose personal name has been deduced from the race-name.

Epping Forest, remnant of the great Waltham forest of Essex, England, preserved by the City of London as a place of recreation; an earthwork known as Ambresbury Banks is the traditional place of defeat of Queen Boadicea and her Britons.

Eprouvette, an instrument for proving the strength of gunpowder.

Epsom, market town on the edge of Surrey Downs, England. Its medicinal springs attracted invalids till the salts were artificially manufactured. Epsom College affords education for sons of medical men; p. 19, 156.

Epsom Salts is a name given to magnesium sulphate ($MgSO_4 \cdot H_2O$) from its occurrence in mineral springs at Epsom in Surrey. Epsom salts are white and crystalline, readily dissolving in water to a bitter solution. In doses of two to four drachms it acts as a painless hydragogue cathartic. Like other saline aperients, it tends to encourage constipation after it has acted, and should not, therefore, be used constantly.

Epstein, Jacob (1880-), sculptor, was born in New York; is best known for his bronze portraits, among which are: 'Duchess of Marlborough' (1917); 'Kathleen' and 'Jacob Kramer' (1921); Joseph Conrad (1924). His Hudson Memorial in Hyde Park was unveiled in 1925. In 1935 his 11 ft. 7 ton statue of Christ, entitled 'Ecce Homo', was exhibited in London's Leicester Galleries.

Epworth League, a society of young people connected with the Methodist Episcopal church; formed in Cleveland, Ohio, in 1889.

Equal Rights Party, name of the party that was popularly known as the Loco-Foco

Party. Another one in the United States had for its object the securing of the right of suffrage for women.

Equation, the statement in symbols of the relationship of equality existing between two algebraic expressions. An equation is obtained by connecting two like magnitudes by the sign of equality (=).

Equations may be true in all possible cases. Thus the equation $(a + b)(a - b) = a^2 - b^2$ is true for all values of a and b . Such an equation is called an identical equation, or an identity simply. Other equations may be true in a restricted number of cases. An equation which is not true for all values of the variables is called a conditional equation, and a solution of such an equation is such a system of values of the variables as will, when substituted for the variables, render the conditional equation an identical equation. Finally, restricting our attention to finite values only of the variables, we may find equations which are not true in any circumstances—e.g. $x + y = 1 + x + y$; and such an equation is said to be impossible or inconsistent.

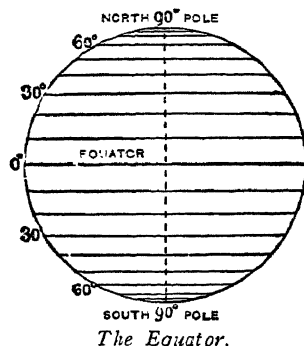
When more equations than one are given connecting the variables, they form a system of simultaneous equations, and the problem arises to determine a common solution, or to show that none exists. See Burnside and Panton's *Theory of Equations* (4th ed. 1899), for the numerical solution of equations.

Equation of Time. The unit of time adopted in everyday life is the time kept by an imaginary sun moving along the celestial equator at the average rate of the real sun in the ecliptic (mean time). The real sun, however, moves at a varying rate, and this, combined with the obliquity of the ecliptic, causes an irregularity in the intervals of time between successive returns of the sun to the meridian. Mean and apparent noon thus differ by a varying amount, and this difference is called the 'equation of time.'

Equations (chemical). Chemical actions are expressed by equations, which represent the bodies present before and after the change. On the left-hand side of the equation the formulæ of the substances taken are put down, while the products of the action are written on the right. Thus $2H_2 + O_2 = 2H_2O$ represents the formation of water by the union of oxygen and hydrogen. The sign of equality represents the law of the conservation of mass, so that the sum of the weights of the bodies taken must be equal to the sum of the weights of the products. The formulæ used on both sides of the equation must, however, not only

represent numerically equal quantities, but must be arranged so as to represent bodies that were actually present. Substances that are unacted on—the water in which the materials may be dissolved, etc.—are not put into equations; neither is the energy that may be absorbed or produced, represented.

Equator, the line drawn round the earth midway between the poles. It is about 24,902 m. in length, and, the earth being approximately a spheroid of revolution, is the longest



line that can be drawn in one plane round the world. Latitude is measured from the equator north and south, and the declination of the heavenly bodies from the intersection of its plane with the vault of the heavens is called the equinoctial.

Equatorial, a telescope mounted so as to follow a star in its diurnal course. Two axes are employed: one, the 'polar axis,' is rigidly fixed in a direction parallel to the earth's axis, the other, called the 'declination axis,' at right angles to the first, and moving with it. The telescope, which is carried by the declination axis, can be pointed towards any object of known position by means of two circles—the 'hour circle,' attached to the polar axis, and the 'declination circle,' to the declination axis; and because of the automatic following of the diurnal motion imparted by the clock, the same object remains continuously in view. The two leading types of equatorial mounting are designated respectively the English and the German. In the former a long polar axis is supported at both ends, the declination axis crossing it at an intermediate point. In the German form the declination axis surmounts the polar axis.

The 'equatorial coude,' or bent equatorial, is on a totally different plan. In this instrument the polar axis constitutes the tube of the telescope. It rotates once in twenty-four hours,

and is bent at right angles, carrying the object-glass at its lower extremity. Two plane mirrors are interposed in the path of the rays collected by the great lens—one for transmitting them along the first section of the tube; the other, fixed at the 'elbow,' for changing their direction so as to enable them to reach the eye of the observer, who, looking down the tube from its upper or northern end, can survey the whole heavens without shifting his place.

Equatorial Current. See *Ocean*.

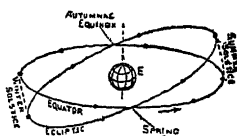
Equilibrium. See *Statics*.

Equilibrium, Chemical. Many chemical actions are reversible—the substances that originally acted may be re-formed from their products under some change of conditions. Thus antimony chloride and hydrogen sulphide are formed if concentrated hydrochloric acid is heated with antimony sulphide; the reaction going the other way if the hydrogen sulphide is passed into not too acid a solution of the antimony chloride. This behavior is in accordance with the fact, investigated particularly by Guldberg and Waage, that the rate at which chemical action takes place is proportional to the mass of the acting bodies in a given volume.

In those cases where a solid is present the problem is somewhat simplified, as the active mass of a solid is constant instead of variable, and corresponds, if in solution, to its solubility.

Temperature also affects the state of equilibrium; for though it accelerates both the forward and back actions, it does so to different extents, and it is thus possible that most chemical changes are reversible under appropriate conditions. See Nernst's *Theoretical Chemistry* (trans. 1895); Van 't Hoff's *Lectures on Theoretical and Physical Chemistry* (trans. 1899).

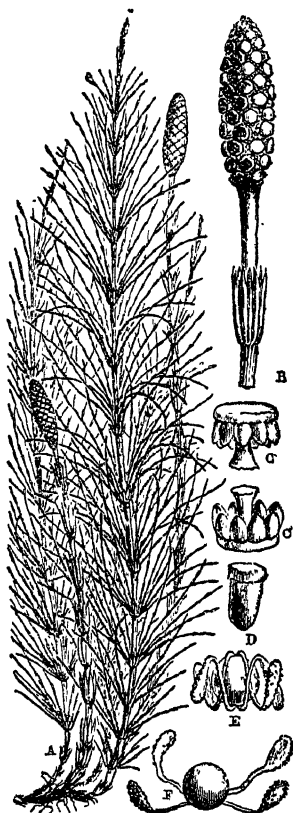
Equinoctial, the celestial equator, a great circle of the sphere marking the extension of the earth's equatorial plane. Parallels of declination run parallel, hour circles are perpendicular to it.



The Equinoxes.

Equinox, either of the two opposite points at which the ecliptic and equinoctial intersect. The word signifies the equality of day and night which prevails over the globe when the sun crosses from south to north of the equator

at the vernal equinox, on or about March 21, and again at its passage from north to south of the same line, about September 21.



Equisetum.

A, Horsetail; B, extremity of stem with cone; C, scale detached from cone and furnished with spore cases; C' the same scale reversed; D, spore case; E, spore enveloped by filiform appendages; F, spore with filiform appendages extended.

Equisetum, a genus of flowerless plants, 'horsetails,' belonging to the Equisetaceæ. They are mostly natives of northern temperate regions, occurring usually in wet, marshy ground.

Equitable Charge or Mortgage. These terms are used interchangeably to denote a transaction or agreement whereby the parties thereto intend that something be given as security, and which is not recognized at law as a

mortgage, but which courts of equity treat as if a mortgage had been created. See **MORTGAGES**.

Equites, or 'horse-soldiers,' commonly translated 'knights,' the designation given at ancient Rome to the richest class of citizens, who, by the constitution of Servius Tullius, about 550 B.C., had to serve in the cavalry.

Equity. A branch of jurisprudence comprehending rules of justice enforceable by courts of chancery, or courts exercising equitable powers, and which were devised by such courts, and are now applied to mitigate the hardships occasioned by a strict application of the inflexible rules of the common law in certain cases. No exact definition of equity, as a technical legal term, can be given, as our equity jurisprudence represents a growth; an attempt through the several centuries of the existence of courts of equity to afford a remedy in all cases where natural justice would seem to require it, and where the remedy at law, if any, was inadequate; and yet equity cannot be called 'natural justice,' without qualifications, as courts of equity are bound by certain principles and by precedents, and cannot always decide as seems to them most just and equitable in the particular case before them.

As a legal system, equity had its origin in England, in the practice of petitioning the king in the *Curia Regis*, for relief when a person had suffered a wrong for which the technical courts of law afforded no adequate remedy. In course of time such petitions became so frequent that the king could not dispense relief in person, and referred them to his chancellor, who was an officer of his court, and in the reign of Edward III. proceedings before him assumed regular forms, and the court of chancery came into existence. This court continued separate and distinct from the courts of law in England until the Judicature Acts in 1873, when it became a branch of the High Court of Justice. Chancery courts existed in most of the United States at the close of the Revolution, but following the lead of New York, many of the states have abolished them, and conferred equitable jurisdiction upon the judges of the courts of law, who administer law or equity according to the nature of the relief sought. This does not abolish equity jurisprudence; on the contrary, it is being constantly developed and strengthened.

Equity will not interfere to prevent a crime as such, but where property rights are involved, it will protect them. See **COMMON LAW**.

Equuleus, the Foal, an ancient constella-

tion s.w. of Pegasus. Ptolemy designated it the 'Section of a Horse.'

Eranthemum, a genus of tropical shrubs and herbs belonging to the Acanthaceæ. Most have beautiful flowers, and a number have handsome foliage as well.

Eranthis, a genus of small, hardy, tuberous-rooted herbs, belonging to the Ranunculaceæ. The most important species is the little winter aconite.

Erased, in heraldry, said of the heads, limbs, etc., of men and animals that have been torn off, leaving a ragged edge.

Erasmus, Desiderius (1466-1536), scholar and critic, born at Rotterdam, of illegitimate birth. He became a secretary, 1492, but continued his studies at the Collège Montaigu, Paris. His fame as a scholar was even then considerable, and he was induced to visit England, where he studied Greek at Oxford, discussed theology with Colet, and began his historic friendship with Thomas More.

But Erasmus was always a bird of passage. Ere long he is found back in Paris, 1500, preparing his *Adagia*, a collection of scattered sayings culled from the writings chiefly of classic authors, which proved the most popular of all his works. His second literary work was the *Enchiridion Militis Christiani* (Handbook of the Christian Soldier), his first theological treatise, 1503. Enroute to England after a sojourn in Italy, Erasmus sketched out the plan of his immortal satire, *Encomium Moria* (the Praise of Folly), published in 1509, written as an oration delivered by Folly to an imaginary audience composed of all sorts and conditions of men. From 1509 to 1514 he resided in England, during which time he prepared his edition of the Greek New Testament, published in 1516, the first attempt to amend the text of the sacred books; and he wrote, at the request of Colet, his *De Duplici Copia Verborum et Rerum*, a text-book of rhetoric intended for advanced Latin scholars.

On leaving England finally, in 1517, Erasmus proceeded to Louvain, where he resided until 1521, and superintended his edition of the *Christian Fathers*. In 1521 Erasmus removed to Basel, and here he remained practically for the remainder of his life. Though always regarded as one of the great forces producing the Reformation, Erasmus never broke with the Church of Rome, and to the last claimed to belong to its communion. Though he could launch the bitterest and most trenchant satires in his *Colloquia* which were published at intervals from 1516 to 1536, against the short-

comings of the Roman clergy, Erasmus nevertheless directed his satire, quite as unsparing, against Luther in the *Diatrise de Libre Arbitrio* (1526) and against Ulrich von Hutten in the *Spongia* (1523). Nor could the clergy themselves sympathize with him. He was too impartial, too little of a partisan, to please them. His calm common sense, his superiority to prejudice, his sanity of judgment, were quite unintelligible to those from whom he might have expected sympathy—his fellow-humanists. But he had no liking for the daily quarrels and literary duels about trifles which



Erasmus.

made up the existence of a sixteenth-century scholar, and his satire on their pedantic fastidiousness in style, entitled *Ciceronianus* (1528), raised a host of enemies against him. In 1533 appeared his *Preparation for Death* (1533), and *Ecclesiastes, or the Christian Minister* (1534). While Erasmus lived he was unquestionably the intellectual dictator of his age. See Richter (1891), Froude (1894), Emerson (1899), P. Smith (1923). The best edition of his works is that by Le Clerc (10 vols., 1703-6).

Erastus, Thomas (1524-83), Swiss theologian, whose proper name was LIEBLER or LIEBER, born at Baden, Switzerland; became successively physician and professor of medicine but is best known in his theological relations, as he upheld the Swiss view of the Lord's Supper; and in a posthumous work on

excommunication, he defined Erastianism. The essence of it was that excommunication is a device of men, and not a divine ordinance; or otherwise, that the sins of Christians were punishable with civil penalties by the magistrate, not by pastoral authority in denying them the sacraments. Erastians came to be the name for those who held the supremacy of the state in ecclesiastical causes; but this doctrine in any such wide sense was not due to Erastus. Erastus died at Basel, where his professorship of medicine had been exchanged for that of ethics.

Eratosthenes (276-194 B.C.), Greek mathematician and poet, known as PENTATHALUS, 'champion in five sports,' was born at Cyrene, and in 235 B.C. was appointed custodian of the great library at Alexandria by Ptolemy Euergetes. He did much to put both chronology and geography on a scientific basis, and made an attempt to determine the size of the earth. See his fragments in Bernhardt's *Eratosthenica* (1822); also Berger's *Die geog. Fragmente des Eratosthenes* (1880).

Erbium (E, 166) is a metallic element of the rare earths which has not been isolated itself, but is probably similar to antimony or bismuth.

Ercilla y Zúñiga, Alonso de (1533-95), Spanish poet, born at Madrid; famed for his epic poem *La Araucana*.

Erckmann-Chatrian, a famous literary partnership, whereof the two members were Emile Erckmann (1822-99) and Louis Gratiot Charles Alexandre-Chatrian (1826-90). Beginning their collaboration in 1848, though at first they had little success, after the publication of *Le Docteur Mathéus* in 1859, popularity rapidly came to them. An unfortunate quarrel which arose between the two friends severed their intimacy, although not their partnership. The most popular of their novels are *Le Fou Yégo* (1862); *Waterloo* (1865); *L'Ami Fritz* (1864); and *Contes Populaires*. They also wrote several dramas, of which *Le Juif Polonais* (1869), known under its English translation as *The Bells*, and *Les Rantzau* (1882), are the best known.

Erebus, in Greek mythology, the son of Chaos, and father of Æther and Hemera (day), by Nyx (night). The meaning of the word is darkness, and it is constantly applied in the poets to the gloomy underworld through which the souls of the dead pass on their way to Hades.

Erebus, Mount. An active volcano in Victoria Land, near 80° s. latitude, discovered by Captain Ross in 1841.

Erechtheum, a famous temple on the Acropolis at Athens, a considerable part of which is still standing, distinguished by the beauty of its columns and the elegance of its Caryatid porch. The present one dates from 409-400 B.C., replacing an older temple destroyed by the Persians in 479 B.C.

Erechtheus, or **Erichthonius**, one of the early heroes of Athens in ancient Greece, was the son of Hephaestus, and was entrusted as a child to Athena. Erechtheus became king of Athens. He instituted the worship of Athena and the Panathenaic festival, and built the first temple of the goddess on the Acropolis. He was deified after his death, and was worshipped in the Erechtheum.

Eregli. (1.) Ancient *Herakleia*, seaport on Black Sea. Here, under Zenophon, the ten thousand Greeks embarked on their return to Greece. (2.) Town, Asiatic Turkey; near it are remarkable hot springs.

Eremurus, a genus of desert plants belonging to the Liliaceae. Many of them produce flower-stalks upwards of 8 ft. in height, surmounted by great hyacinth-like spikes of bell-shaped flowers—white, red, or yellow.

Eretria, now **Aletria**, was one of the chief towns in Euboea, in ancient Greece; was very prosperous in the early ages of Greece, but during the 6th century B.C. was exhausted by a prolonged struggle with Chalcis. In 490 B.C. it was taken by the Persians, and its inhabitants were transported to Media.

Erfurt, town, province Saxony, Prussia, for generations the chief town in Thuringia, and still wearing a mediæval aspect. Its chief ornament is the cathedral, dating from the 12th to the 15th century. In the monastery of St. Augustine, now an asylum, is the cell once occupied by Luther. Erfurt is famous for the growing of flower seeds, flowers, and vegetables; p. 85,202.

Erg, in dynamics, the unit of work or energy, introduced by the British Association and employed in the C. G. S. system. It is defined as the work necessary to overcome the resistance of a dyne over the space of one centimeter. The power of an engine is, therefore, known by specifying the number of ergs per second of which it is capable.

Ergot, a name applied to the sclerotium of a fungus attacking certain grasses, especially rye.

Eric XIV., king of Sweden (1533-77), was the son of Gustavus I., and ascended the throne in 1560; was the pioneer of Sweden's Baltic policy by acquiring Esthonia. Like Louis XI., he feared and distrusted the nobility,

and was guided by low-born councillors: his barbarous murder of the three Stures, 1567, brought about a revolt of the nobility, and he was deposed. After nine years' confinement, he is believed to have been poisoned by his brother and successor John.

Erica, a genus of evergreen shrubs or bushes, with tough stems and hard leaves, commonly known as heaths. The greater number of heaths are South African plants, but many species are found in other parts of the world.

Ericaceae, the heath family, including a large number of shrubs or small trees, many of which are evergreen.

Ericson, **Leif**, a Norse discoverer, the son of Eric the Red. About the year 1000 he went from Greenland to search for the new land to the west; the site of his landfall and of his winter-quarters have been variously identified by antiquarians as the Labrador, the Newfoundland, and the New England coasts. The facts regarding the voyage are recorded in the Icelandic sagas, the substantial trustworthiness of which is now widely accepted. See VINLAND.



Lake Freighter passing through Locks of Erie Canal.

Ericsson, **John** (1803-89), famous engineer and inventor, was born in Langbangshytlan, province of Vermland, Sweden. He invented a condensing-flame engine, a caloric engine, 1833, and appliances for the improvement of naval steam-engines and new methods of ship propulsion, while in England. In 1839, he went to the United States, where he designed the screw-propeller for the warship *Princeton*, whose construction marked an epoch in naval history. In 1861 he built for the U. S. gov-

ernment the famous iron-clad turreted vessel, the *Monitor*. He also invented the steam fire-engine, a torpedo boat, the *Destroyer*, 1881, a hydrostatic gauge for fluids under pressure, an instrument for measuring distances at sea, and a solar engine (1883). He was one of the first to apply the principle of surface condensation to steam navigation. Consult *Life* by W. C. Church (2 vols.).

Eridanus, an ancient constellation, divided into an equatorial section, extending from the foot of Orion to the front paws of Cetus, and a southerly branch, winding thence down to its junction with Hydrus.

Erie, city, Pennsylvania, county seat of Erie co. It is on Lake Erie, the only lake port in Pennsylvania; Presque Isle Bay, 4 m. long and a mile wide, forms the largest land-locked harbor on the lake and is the headquarters of an important lake commerce. Erie is a port of call for Upper Lake lines communicating with Duluth daily. Noteworthy public and philanthropic institutions are St. Vincent's Hospital, the Hamot Hospital, a public library, and the State Soldiers' and Sailors' Home. The Wayne Block House is a landmark of historic interest.

Important articles of manufacture are brass and malleable iron goods, forgings, electrical supplies, oil supplies, rubber goods, silk, leather, paper, and agricultural implements. The principal item of export is the lake region iron ore, of which the city is one of the chief distributing points.

Erie was originally settled by the French, who erected Fort Presque Isle at the entrance of the bay in 1753. The French removed to Detroit, however, after Pontiac's War, and Erie lapsed into a wilderness until the arrival of settlers from Massachusetts and Connecticut in 1795. It was the American base of operations on the lake during the War of 1812; p. 116,247.

Erie Canal, the main member of the New York State Barge Canal, extends from Buffalo to Troy, connecting Lake Erie with the Hudson River.

Erie, Lake, one of the Great Lakes of North America, is 241 m. long, 57 m. wide, and has a mean depth of about 90 ft. Its outlet to Lake Ontario is the Niagara River and the inlet from Lake Huron is through the Detroit and St. Clair Rivers. The boundary line between the United States and Canada traverses the lake and its waters touch the northern parts of Pennsylvania and Ohio and the western corner of New York. Its commercial importance has been greatly increased by its

canal connections. There are many good harbors and several important cities on its shores, chief among which are Buffalo, Cleveland, Toledo, Erie, and Sandusky.

Erie, Lake, Battle of, an important naval engagement of the War of 1812, which took place Sept. 10, 1813, between the United States fleet under command of Oliver H. Perry, and the British fleet under command of Robert H. Barclay. It ended in Perry's victory—announced in the now famous words, 'We have met the enemy and they are ours.'

Eries, an extinct North American Indian tribe, whose name survives in Lake Erie, the shores of which they formerly inhabited.

Erigena, **Joannes Scotus**, British philosopher and theologian, was born probably between 815 and 825 A.D. Scotus took part in the predestination controversy regarding the views of the monk Gottschalk. His tract on predestination was twice condemned by church councils, and his eucharistic views were also frequently censured in later times. After the death of Charles the Bald, in 877, it seems most probable that Scotus went to England, where, after some years, he was murdered by his pupils. He developed in his *De Divisione Naturæ* a philosophical system closely akin to neo-Platonist speculation. As to predestination, Scotus held that there can be only one predestination—to good; for evil has no ultimate reality, and God cannot either foresee or predestine it. The writings of Scotus had a profound influence on mediæval mysticism. His complete works are contained in *De Divisione Naturæ* (editio princeps by Gale, 1681; German trans. by Noack, 1874). Expositions and commentaries include Huber's *Scotus Erigena*; Alice Gardner's *Studies in John the Scot*.

Erigeron, a genus of daisy-like, composite plants. It includes, among other species, the Blue Fleabane bearing small heads of yellow and purplish flowers; Robin's Plantain, with light-bluish purple flowers; Sweet Scabious, a common weed with a white flower, tinged with purple; the Daisy Fleabane, and Horse Weed and Butter Weed.

Erin, **Eirinn**, or **Eirenn**, the old Gaelic name of Ireland. The form Erin gained currency chiefly through the medium of Moore. *Erin go Bragh*—'Ireland forever'—was the old Irish war cry.

Erinna, a poetess of Lesbos, in ancient Greece, thought by some to have been a friend and contemporary of Sappho (600 B.C.), but more probably belonging to the early Alexandrian period. She left poems held worthy to rank with those of Homer. Only fragments

remain, which may be found in Berg's *Poeta Lyrici Græci*.

Eriodendron, a genus of tropical trees of the natural order Malvaceæ, known sometimes as cotton-silk trees from the cotton-like fiber contained in the seed pods. The Kapok Tree, is perhaps the best known species; its fibers are used in mattresses, pillows, and life belts.

Eriostemon, a genus of dwarf Australian evergreen shrubs belonging to the Rutaceæ bearing starry white and pink flowers in winter and spring.

Eriphyle, in Greek story, the wife of Amphiarus, the seer, whom she persuaded to join the expedition of the Seven against Thebes, though he knew it would cost him his life to do so.

Eris, in ancient Greek mythology, the goddess of strife. It was she who cast down the golden apple inscribed 'to the fairest,' at the wedding feast of Peleus and Thetis, thus causing the rivalry of Hera, Athena, and Aphrodite, and indirectly the rape of Helen and the Trojan War. Virgil introduces a similar Latin deity under the name of Discordia.

Eritrea, Italian colony, in northwest Africa, extends for about 670 m. along the west shore of the Red Sea, with Abyssinia on the southwest and the Anglo-Egyptian Sudan on the west and northwest. The climate varies. The lowlands are excessively hot, but the plateau region is cool and healthful. Camels, sheep, cattle, and goats are raised. Gold and pearls are exported, as well as coffee, from Abyssinia, palm nuts, and hides. Foodstuffs, cotton goods and oil are the chief imports, much of the cotton goods being exported to the Sudan.

The seat of the colonial government is at Asmara, but the chief city and business center is Massowah, which has a harbor, and is the natural port for Abyssinia. The population numbers about 650,000. Eritrea came under British control after the conquest of Italian East Africa in 1941.

Erivan, a district in the eastern part of Russian Armenia, now constituting the largest part of the Armenian Republic. Agriculture is the principal occupation in the lowlands, the apricots of Ordubat and the peaches of Erivan being especially fine. The seat of government is at Erivan and it is known as the Armenian republic of Erivan.

Erivan, fortified city in Erivan, Armenia, capital of the Armenian republic. A Persian fortress overlooking the town and a beautiful mosque are features of interest; p. 90,000.

Erlangen, town, Bavaria, is the seat of a

university founded in 1743, and has large breweries, and cotton, hosiery, and other manufactures; p. 24,874.

Erlau, (Hungarian *Eger*), town, Hungary, has several beautiful buildings, including a cathedral in Italian style, the archbishop's palace, a library, and the remains of a mosque. The red wine of Erlau is considered the best in Hungary; p. 28,000.

Erlkönig, *Der* (the erl-king) a mythical character in German folklore, who is represented as charming souls from earth, particularly by the power of music. The legend has been immortalized by Goethe in his ballad *Der Erlkönig*.

Ermine, originally the name given to the European stoat when it acquires its white winter coat. As the name of a fur, however, it applies generally to the winter pelt of any weasel, white except the black tip of the tail. Ermine has long been used for trimming or lining the robes of dignitaries, from which it has acquired a special significance in heraldry. See WEASEL.

Erne, or **Sea Eagle**, a bird widely distributed over the Old World, and closely related to the American bald eagle. It is brown with a white tail, and feeds on carrion, but frequently destroys lambs on pasture lands near the coast.

Ernestine Line, the elder of the two dynasties of the German (Saxon) family of Wettin, the younger being the Albertine line.

Ernst, Heinrich Wilhelm (1814-65), Austrian violin virtuoso, born at Brünn, one of the best exponents of the style of playing created by Paganini. His compositions include his *Élégie*; his *Fantasias* on Hungarian airs, *Otello*, and *Le Prophète*.

Ernst, Oswald Herbert (1842-1926), Am. soldier, col. of engineers in the regular service in 1903. His work includes improvement of coast defences and the deepening of harbor and river channels. He was a member of the Isthmian Commission in 1899 and 1904.

Eros, a minor planet (No. 433). The brightness of Eros, when nearest to the earth, is that of a seventh-magnitude star, but shows at times singular fluctuations. The diameter of Eros is unlikely to exceed 20 m.

Eros, in ancient Greek mythology, the god of love, represented as a mischievous boy, armed with a bow and arrows, which he shoots at his victims; the wounds caused by his arrows inspire love. (See *ΨΥΧΗ*).

Erosion is the process by which the surface of the land is being attacked, eaten into, and

sculptured into valley, hill, and cliff. The agencies of erosion are the rivers, which cut cañons and gorges; the rain, which washes away the finer particles from the surface; the sun, which by heating the rocks loosens and detaches their particles; the frost, which expands the water in the crevices of the rocks and wedges them open; the sea, which is constantly undermining its cliffs; the winds, springs, glaciers, and many burrowing animals, etc. The rapid loss of soil through erosion has become a problem for government conservation agencies. One of the major projects of the Tennessee Valley Authority organized as part of the 'New Deal' program, is that of arresting the soil erosion of the arable lands in its district. See CONSERVATION; also AGRICULTURE, U. S. DEPT. OF.

Erosion, Gun Bores. The substitution of smokeless gunpowders for the older powders gave rise to a serious defect, which limits the possible power development of any caliber, and which cannot be overcome until greater knowledge of the causes is acquired. At present, the science of ballistics is more hampered in development by this problem than by any other.

Erotic Literature, chiefly poetry, has for its object the depiction of the passion of love. Among the Greeks the principal erotic poets were Lesbia, Sappho, Anacreon, and Theocritus. Among the Romans may be mentioned Catullus, Horace, and Ovid. Erotic poetry has always been a favorite form of literature in France, from the *chansons* and *pastourelles* of the middle ages, through the troubadours, and the renaissance erotics of Marot, Ronsard, and Du Bellay, those of La Fontaine in the 17th century, and of Gentil-Bernard, Dorat, Bernis, Bertin, and Chenier in the century which followed. One of the best periods of erotic poetry in English literature was that of the Civil War and Commonwealth, which produced the lyrics of Herrick, Waller, Carew, Suckling, Lovelace, Cowley, and others.

Erotomania, a manifestation of insanity associated with the sexual feelings. It is not in itself a disease, but a symptom.

Erratics. In Europe and the greater part of North America blocks of rock are frequently found scattered about which do not belong to the formation on which they lie, while very often they closely resemble some variety which is known to occur elsewhere in the district. These are known as 'erratics' or 'travelled blocks.' Charpentier and Agassiz proved that they bore a close resemblance to the materials which were being laid down by existing glaciers,

and the erratics are ascribed to the ice-sheets which covered the countries where they are found during the Glacial period.

Many remarkable anomalies in distribution are known, which suggest that the direction taken by the ice-flow was not the same at different periods of the Ice Age. All erratics have not necessarily been transported by glaciers and ice-sheets, but it is generally agreed that the vast majority of those which are found in northern latitudes are to be accounted for in the manner above described, and only on a small scale has floating ice taken part in the process. See GLACIAL PERIOD; also James Geikie's *The Great Ice Age* (3d ed. 1894).

Error, like truth, can be predicated only by judgments. Mere ideas, or mere sensations, taken in abstraction, can neither be true nor false. Wherever we speak of error, there must be some measure of underlying truth which makes the error explicable. The traveller who is misled by a mirage misinterprets what he sees just because the mirage is so like the supposed reality, and therefore so deceptive. Hence we often speak of an error as 'natural.'

Error, Writ of. The writ issuing out of a competent court of appellate jurisdiction to review the judgment of an inferior court. Only errors of law may be reviewed by means of this writ, so that the fuller remedy of appeal which brings up errors of fact and law has been extended by statute in a large number of the United States to all forms of action. It is the sole mode by which the United States Supreme Court reviews the judgments of the State Courts and judgments of the United States Circuit Courts in actions at law.

Errors of Observation. When observations of a scientific character are being made it is impossible to evade certain small errors. These may be due to instrumental imperfections, or to what is called the personal equation of the observer. The question then arises how best to combine the observations so as to reduce the effect of these unavoidable errors to a minimum. To take the very simplest possible case, suppose a quantity to depend for its value upon a number of separate observations, all equally probable. Then the best value will be obtained by taking the mean of the values. This mean will differ from the individual observations by a set of differences—some positive, some negative—whose algebraic sum will be zero. But the fact that these differences exist indicates an average deviation from the mean, and shows that this mean is after all only an approximation to the real value. The approximation will

be closer the smaller the differences are; and the closeness of the approximation can be calculated according to the recognized principles of the theory of errors, from the value of the differences. To take a concrete example, the velocity of light has been determined from various forms of experiment to be $299,890 = 30$ kilometers per second where the quantity ± 30 indicates the degree of *probable error*, and means that the velocity lies between the assigned limits. See Merriman's *Method of Least Squares* (1885).

Erskine, Ebenezer (1680-1754), founder of the Secession Church, Scotland, took a leading part in what is known as the Marrow Controversy. Erskine was deposed from his charge, along with three other ministers (1733). The four 'martyrs' formed 'the Associate Presbytery.' Erskine was deposed from the ministry by the Anti-Burgher synod (1748). His *Sermons and Discourses* were issued in 1762 in 4 vols.

Erskine, John (1509-91), of Dun, Scottish reformer, was a prominent supporter of Knox, though of a much milder and more conciliatory temper. He assisted in the compilation of the *Second Book of Discipline* (1578).

Erskine, John (1695-1768), Scottish advocate and writer. He wrote *Principles of the Law of Scotland* (1754), and, after retiring from the chair of Scots Law in Edinburgh University, *Institutes of the Law of Scotland* (1773), both works being useful text-books for many years.

Erskine, John (1879-), American author, president of the Juillard School of Music in New York (1927). He has written numerous works including poetry and travesties. Among his works are *The Elizabethan Lyric* (1903); *Leading American Novelists* (1910); *Democracy and Ideals* (1920); *Private Life of Helen of Troy* (1905); *Uncle Sam* (1930); *Galahad* (1926); *Tristan and Isolde* (1932).

Erskine, Thomas, First Baron Erskine (1750-1823), Lord Chancellor. His first case was the successful defence of Captain Baillie for libel, which at once established his fame as a barrister. In 1789 he defended Stockdale the publisher, when he made, according to Lord Campbell, 'the finest speech ever delivered at the English bar.' He lost all opportunity of promotion by his opposition to Pitt and his defence of Tom Paine (1792). It was not till the death of Pitt in 1806 that he became a member of the cabinet as Lord Chancellor. Lord Brougham maintained that Erskine was the finest speaker he had ever

heard. His *Speeches* were published in 4 vols. in 1847.

Eruptive Rocks include all those which have been formed as lava-flows or as intrusive sheets injected by volcanic action into the rock masses which form the earth's crust, and have cooled on or at some depth below the surface.

Erymanthus, a lofty mountain in Arcadia in Greece; was the haunt of the famous boar killed by Hercules. Its modern name is Olonos.

Eryngium, a genus of hardy umbelliferous plants, characterized by bearing the flowers in a hard, prickly head, and including the sea-holly whose hard, thistle-like structure and grayish color make it a conspicuous object in gardens.

Erysimum, a genus of plants belonging to the Cruciferae, characterized by producing a four-sided pod which opens by two keeled valves. The commonest species is the worm-seed or treacle-mustard, an annual plant often seen on waste ground.

Erysipelas, known also as 'St. Anthony's fire' and 'the rose,' an acute spreading inflammation generally of the skin or subcutaneous tissues, due to a streptococcus. The bacillus is not found in the blood, but its toxin (the poison it generates) is carried through the body, and causes the severe constitutional symptoms often found. A red patch may after a day or two mark the site of the original scratch where the streptococcus first entered. This patch extends, joins other patches, and becomes deeper red, with a somewhat raised edge, felt on passing a finger gently over the inflamed part. This is painful, burning, tender to the touch, and more or less boggy on pressure. If the toxin is sufficient in quantity, there is high temperature, perhaps 104° or 105° F., the sufferer may even die of exhaustion, or of some complication arising from swelling of the parts involved.

Erythema, or *Rose-rash*, a superficial redness of the skin, neither infectious nor contagious, but sometimes accompanied by general malaise or discomfort with slight rise of temperature, and occasionally by a little burning or itchiness. It appears frequently in teething children, but generally disappears in a few hours, leaving no trace, and is thus distinguished from scarlet fever and measles. It is also sometimes found in rheumatic children.

Erythræa, a genus of hardy plants belonging to the Gentianaceae, includes the common centaury of Europe, which is often to be found in waste, arid ground. It has smooth, oblong

leaves, and bears rose-colored flowers at the ends of a much branching flower-stalk.

Erythrina, a genus of tropical trees and shrubs belonging to the Leguminosæ, characterized by the possession of trifoliate leaves, large racemes of red flowers, includes the common coral tree.

Erythrophloeum, a genus of leguminous, evergreen trees, natives of tropical countries. They are commonly spoken of as redwater trees, by reason of the red juice which escapes when the bark is injured.

Erythroxylon, a genus of evergreen trees, natives of warm countries. The most important species is *E. coca*, the source of the coca leaves of commerce.

Eryx, now called Santo Giuliano, a steep and high mountain in Northwestern Sicily, on whose summit there stood in ancient days a famous temple of Aphrodite.

Erzerum, capital of the vilayet of the same name in Turkish Armenia. The town is commanded by a citadel, founded in the 5th century by Emperor Theodosius the Younger, and before the Great War was reckoned the strongest fortress in the Turkish dominions; p. 45,000.

Erzgebirge, mountain range separating Bohemia from Saxony, about 100 m. in length, and with altitudes of from 3,000 to 4,000 ft. The range derives its name from its wealth of mineral ores (*erze*)—lead, silver, tin, iron, copper, nickel, and others.

Esau, (Heb. 'hairy'), the elder son of Isaac, twin brother of Jacob, to whom he sold his birthright for a mess of pottage. His history is intertwined with that of Jacob and is related in Genesis.

Escadrille, a section of the French Flying Corps most commonly employed for scouting and escorting bombing craft.

Escarp, a term in fortification for that bank of a ditch which is farthest from the attackers, and therefore nearest to the fort which the ditch surrounds. The other bank is termed the counter-scarp.

Escarpment, a line of inland cliffs or steep, grassy slopes, due chiefly to the agencies of denudation acting on land surfaces, especially where a softer formation underlies a harder, both sloping in the same direction. When best developed the upland surface slopes away gradually, following the dip of the hard stratum. This is called the dip-slope, and the escarpment is perpendicular to it. In America the steep wall forming the west bank of the Hudson River for 30 m. above New York City, known as the Palisades, is an escarpment. A

great erosion escarpment passes through Western New York parallel to Lake Ontario and it is the plunge of a river over this from the highlands above that forms Niagara Falls.

Eschar, a surgical term for the slough of dead tissue produced by caustics, or by the actual cautery.

Eschatology, or the doctrine of the last things, is a term under which Christian theology groups its teachings regarding the final destiny of man and the world. The 'last things' are variously enumerated, but the whole ground is covered by the four interdependent stages—the return of Christ, the last resurrection of the dead, the last judgment, and the final recompense. See IMMORTALITY; PURGATORY. Consult Dörner's *System of Christian Doctrine*; Davidson's *Doctrine of Last Things*; Sharman's *Teaching of Jesus about the Future*.

Escheat, the determination of tenure of land by reason of failure of heirs of a deceased owner, or by operation of law, and the consequent reverting of the title to the state, or in England, to a superior lord or the crown. The doctrine is of feudal origin, and is in accord with the theory that the state or crown was the original owner of all land (see TENURE). 'Corruption of blood' and escheat of the guilty person's lands following conviction for treason, capital felonies, and murder, was prohibited by the Constitution of the United States.

Eschscholtzia, or California Poppies, a genus of hardy plants belonging to the Papaveraceæ. They are mostly glaucous, and possessed of much-divided leaves. The flowers are usually white, yellow, or orange, and are very showy and beautiful in form, not unlike poppies.

Escobedo, Mariano (1827-1902), Mexican soldier, took a distinguished part against the French and against Maximilian. In the battle of Calpulalpam, he was captured and sentenced to be shot, but was spared and soon escaped. He was minister of war in the cabinet of Lerdo de Tejada, with whom he went into exile, and subsequently, returning to Mexico, was president of the supreme military court of justice (1882-4).

Escorial, The (Sp. 'the place of ashes'), vast monastery-palace of the kings of Spain in Guadarrama Mts., near Madrid; built by Philip II., and dedicated to St. Lawrence. In honor of the saint's martyrdom it takes the form of a gridiron, is built of granite, and measures 744 by 580 ft. The thousands of rooms and miles of passages are mostly gloomy and small; but the church is very large and

splendid, with some magnificent altars by Giacomo Trezzo and other Italian artists. Monks have occupied parts of the palace since 1885.

Escrow. The delivery of a completely executed deed or other instrument to a stranger to the transaction, upon the condition that he shall deliver it to a person named therein upon the happening of some event, the expiration of a certain time, or the payment or performance of some obligation. If the condition is not complied with, the person who delivered the instrument in escrow has the right to demand its return.

Escutcheon is the heraldic term for a shield. An inescutcheon, however, or escutcheon of pretence, has a more special significance. It is a small shield containing the arms of his wife borne by a man in the center of his own shield when the wife is an heiress in the heraldic sense—when she is the representative of her family, having no male relatives. The inescutcheon, variously charged, is also sometimes employed as an honorable augmentation.



Escutcheon of Pretence.

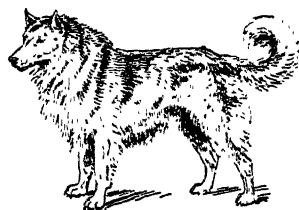
Esdraelon, or Jezreel, the great plain stretching across Central Palestine. It was 'the battlefield of Palestine.'

Esdras, The Books of. The First Book of Esdras is largely a compilation from the books of Chronicles, Ezra, and Nehemiah, the only passage of non-canonical origin being the narrative of a contest regarding the respective merits of wine, kings, women, and truth. Concerning the date, all that can be said is that the book was used by Josephus. See Latin text in *Cambridge Texts and Studies* (1895); Bissell in *Lange's Commentary* (Am. ed., 1880).

Eskers, Kames, or Asar (Swedish), are long, narrow, steep-sided mounds of sand and gravel, found only in countries which have been, in recent geological times, covered by a great ice-sheet, the best examples occurring in Scotland, Ireland, North America and Sweden. They rest upon the glaciated surface of the rocks, or on the boulder clays of the Ice Age, and are evidently later in formation than the main mass of the glacial drift.

Eskimo Dog, a shaggy, whitish, medium-sized dog, native to Arctic America and used

by the Eskimo in drawing sledges and as an aid in hunting. It was originally a tamed Arctic wolf, and the domestic breeds were frequently reinforced by crossing with wild wolves. Since whalers, explorers, and miners have mingled with the Eskimo, a great variety of dogs have been introduced, and the original 'husky' is uncommon save in the remoter districts, especially of Greenland and the neighboring parts of the Arctic mainland. See books of travel relating to that region.



Eskimo Dog.

Eskimos, Esquimaux, or Usquemowz (the 'Huskies' of modern whalers), are the primitive people inhabiting the northern regions of North America. They extend from Greenland, across the arctic islands of Canada, into Alaska and the Aleutian Islands, and there is a detached section on the Asiatic side of the Bering Strait. The prevailing opinion is now that they have not entered America from Asia, but are of purely American origin. Innuít or Inweét, meaning 'native men,' is the name which they apply to themselves.

Ethnologically the Eskimo are of three types, the Greenland, Alaska and Central. The Central Eskimo in Baffin Land, around Hudson Bay and along the coasts of the many islands of the extreme north retain much of their original culture. Taking them as the original stock, we find in them the best example of a type of people in a narrow environment. During the long winters they cannot secure food except from the sea and in the short summers find their time occupied in hunting the reindeer. The chief animal food, however, is the seal. In winter the houses are of snow, in summer tents of sealskin are used. The kayak is the summer hunting-boat, the transportation of camp equipage, women and children being by means of large skin-covered boats usually fitted with sails. In winter transportation is by dog-sleds.

The religious ideas and myths of the Eskimo are quite simple. Their chief spirit seems to be a woman, called Sedna, the mother of the seals, who is easily offended, and in revenge

takes away the seals, reducing the people to a state of famine. A feature of their belief is the idea that the anger of this spirit can be appeased by a public confession of misdeeds. See the Hakluyt Society's publications; Nansen's *Eskimo Life* (1893); Nelson's *Report to Smithsonian Institution* (1899); Boas's *The Central Eskimo*, and Stephenson's *My Life with the Eskimo* (1913). Professor Rabinowitch of McGill University reported in the May, 1936, issue of the Canadian Medical Association Journal that an Eskimo eats five to ten pounds of meat daily; seal, walrus, and white whale. Blueberries and stomach contents of the caribou supply carbohydrates. The Eskimos are remarkably free from infection and can tolerate extreme pain, cold, and fatigue. They are liable to nosebleeds because of over-rich blood, and have little resistance to influenza germs but are free from practically all other diseases. Like all 'primitive' races, however, they cannot resist the temptation of alcohol.

Esne, or Esneh (ancient *Latopolis*), town, Upper Egypt, on the River Nile. In addition to a Coptic monastery, there is an ancient ruined temple to the god *Khnun*.

Esopus grit, a rather fine-grained, compact, black siliceous shale, forming the lowest member of the Middle Devonian in the Eastern United States.

Esoteric, remote from general understanding, intelligible only to those of special ability or preparation; opposed to exoteric. The term is now applied to any writing or doctrine of more than ordinary difficulty.

Espalier, a form of fruit tree in which the tree is trained by pruning and grafting, flat against a trellis, so as to produce a uniform arrangement of the branches and a regular space between each pair. In about sixteen years the wood of the tree is fully established.

Espartero, Baldomero (?1790-1879), Spanish regent, general, and statesman. He retired from public life (1856), though the extreme Liberals talked of making him king in 1868.

Esparto Grass, a tall grass, native of the countries bordering the Mediterranean, with narrow, uniflowered spikelets, arranged to form a graceful, silky inflorescence, and convolute leaves. It has great commercial importance in England for the manufacture of paper.

Esperanto (signifying 'one who hopes') is an international language constructed from elements largely common to the Aryan tongues. It was so named because the first

brochure, published in July, 1887, by Dr. L. L. Zamenhof, of Warsaw, entitled 'A Plea for an International Language,' was signed 'Dr. Esperanto.' It has been introduced as an international auxiliary language—in commerce, to save translating and preparing new advertising matter for the extension of business into new territory; in science, as a medium for *resumés* and translations, in travel and elsewhere. The grammar of Esperanto is absolutely regular. The pronunciation and orthography are simple and phonetic. The order of words is fairly free, enabling the writer to follow much the order in his own language.

In 1906 the London Chamber of Commerce placed Esperanto on its examination list, and it is one of the subjects for teachers' certificates in Great Britain. It is a study already introduced into many schools and colleges, especially in France, Germany, and England. In 1925 the International Telegraphic Union gave official recognition to Esperanto as a 'clear language' for telegraphy. It is estimated that 100,000 people can speak Esperanto. A good text-book for English-speaking people is Kellerman's *Complete Grammar of Esperanto*.

Espinas, Alfred Victor (1844-1922), French sociologist and educator, professor of historical sociology at the Sorbonne. His works include *Des Sociétés Animales* (1878); *Philosophie Expérimentale en Italie* (1880); *Histoire des Doctrines Economiques* (1893); *Les Origines de la Technologie* (1897).

Espinel, Vicente de (1550-1634), Spanish writer and musician, an ecclesiastic whose lyric poems are extremely melodious and unforced. He is, however, best known by his semi-picaresque novel, *Relaciones de la Vida del Escudero Marcos de Obregon*.

Espirito Santo, state, Brazil. Flat in the north, the south is covered with spurs of the Serra dos Aimores, culminating at nearly 4,600 ft. The cultivation of sugar, cotton, and coffee is the chief occupation. Area, 17,310 sq. m.; p. 587,451. The capital is Victoria.

Espiritu Santo, largest island of New Hebrides, very mountainous in the interior, some of the heights exceeding 5,000 ft., greatest length 65 m., breadth, 20 m., area, 1,868 sq. m.

Espronceda, José de (1810-42) Spanish poet, failed in his ambitious dramatic pieces but as a lyrical poet he was undoubtedly the first of the 19th century in Spain. His most famous works are *El Diablo Mundo*, *El Estudiante de Salamanca*, *El Verdugo* and *A la Patria*.

Espy, James Pollard (1786-1860, American meteorologist, originated the theory of atmospheric disturbance due to the rising of air rarefied by heat. He was appointed meteorologist to the War Department in 1842, and instituted the first system of daily weather observations and maps tracing the progress of storms. He wrote *The Philosophy of Storms*.

Esquimalt, seaport, Vancouver Island, Canada. It is strongly fortified, and was formerly the headquarters of the British Pacific Squadron. It contains a naval yard and a Canadian government dry dock, 430 ft. long.

Esquimaux. See Eskimos.

Esquire. This term (in Nor. Fr. *escuyer*) originally denoted the attendant of a knight, who bore his shield or armor. According to Sir Edward Coke any one is entitled to be termed esquire who has the legal right to call himself a gentleman, the latter being a man who lawfully bears a coat-of-arms, either conferred upon him or inherited. In Great Britain at the present time there is a certain amount of doubt as to who is entitled to be termed esquire, while in the United States certain people would restrict the application to professional men or those of recognized social position.

Esquirol, Jean Etienne Dominique (1772-1840), French psychologist, and one of the pioneers of humane treatment of the insane. At the Salpêtrière, the Bedlam of Paris, where he was appointed (1811) resident physician, Esquirol gave clinical teaching, and from that place exercised such an influence as resulted in a new and wiser treatment for the insane all over the world.

Essay. The essay as we now understand it is usually a short literary prose composition, embodying only a selection of its author's knowledge and views on a given subject. It rarely pretends to be exhaustive or final; it is a series of personal comments rather than a finished argument—a cultured glance, rather than a careful examination. An essay may also be critically self-centered, as are those of Macaulay and Matthew Arnold; it may be closely reasoned and argumentative, like Locke's *Essay Concerning Human Understanding*; it may penetrate into every aspect of a subject, like Burke's *Essay on the Sublime and Beautiful*; but for such works, review, memoir, and treatise are possibly better terms.

It is Montaigne who stands as father of the essay as we now understand it, but it was not until Addison and Steele founded the *Spectator* in 1711 that the essay was really popularized in England as a literary form. The fashionable

age of the essay lasted for many years, helped onward by Johnson in the *Rambler* and the *Idler*, and Goldsmith in the *Bee* and *The Citizen of the World*, but it did not come to its finest flower, after Addison and Steele, until the publication, in 1723, of *Elia* by Charles Lamb, and in 1833 of *The Last Essays of Elia*. Contemporary with Lamb was Hazlitt and Leigh Hunt. With these three men to support it, the essay enjoyed another term of popularity. A little later came Macaulay, with his Edinburgh reviews in the guise of essays; and Thackeray, with the genuine thing in the *Roundabout Papers*. But the essay has since declined in favor; and to-day, although many essays are written, hardly any of their authors are essayists first and foremost, but are novelists, historians, poets, or men of affairs first, and essayists by way of diversion or relaxation. Of writers since Macaulay, Matthew Arnold is most notable. Chesterton is more recently a representative of the English essay. Among the notable American essayists are Emerson, Lowell, Henry James, Howells.

Essen, town, Prussia, Germany, stands in the Ruhr coal-field. It is the seat of the world-renowned establishment of Krupp, the largest steel works in Europe, especially famous for its cannon. There are in addition machine shops, as well as tobacco and other factories. The minster church is one of the oldest churches in the empire; p. about 664,451. Essen was bombed repeatedly by the Allies in World War II. See KRUPP.

Essenes, a small Jewish sect or order of the time of Jesus, about whom there exists a most perplexing variety of opinion. The various notices of the Essenes agree generally in attributing to them the following characteristics: preference for agricultural life; community of goods, and common meals—prepared by their elected priests; abstinence from marriage; prayers towards the east before sunrise; daily ablutions in cold water; strict observance of the Sabbath; prohibition of oaths and of animal sacrifices; belief in immortality without a resurrection, the body being contemned; and a peculiar doctrine of the angels. It thus appears that the Essenes practised a mystically colored asceticism. See Schurer's *History of the Jewish People in Time of Christ* (1890); Lightfoot's *Colossians and Philemon* (1875), the larger *Lives of Christ*.

Essential Oils are odorous liquids occurring in many plants, from which they are extracted by pressing or distillation, used as solvents, and as diluents for paints and varnishes, and as perfumes and flavors.

Essex, maritime co. in the s.e. of England, between the Stour and the Thames. The coast is deeply indented by the river estuaries. Agriculture and stock-feeding are the principal occupations, and large quantities of fruit and vegetables are grown for the London markets. The Colne oyster fishery is very important. Several of the coast places are favorite seaside resorts, and the port of Harwich has great Continental traffic; p. 1,062,000.

Essex, Earl of, a title borne by six different families in English history, The Mandeville, the Bouchier, the Cromwell, family, one of whom, Thomas, was created earl in 1540. Shortly after his execution, another family, that of the Parr, the Devereux, and the Capel.

Essex, Robert Devereux, second Earl of (1567-1601), son of Walter, first Earl of Essex, appeared at court in 1584, later becoming one of the chief favorites of Queen Elizabeth. He took part in Drake's expedition to Portugal, commanded an expedition to Normandy, and the expedition to the Azores known as 'the islands voyage.' In 1599 he became lord-deputy of Ireland. Falling into disgrace through his proceedings there, he made his position worse by foolishly attempting to excite (1601) a riot in London. He was tried, Bacon being the prosecutor, and condemned to death; and, after some hesitation on the queen's part, he was executed. See Devereux's *Lives of the Earls of Essex* (1853); Abbott's *Bacon and Essex* (1877); Strachey's *Elizabeth and Essex*.

Essex Junto, a name applied by John Hancock in 1781 to a group of men mostly resident in Essex co., Mass., who from this time until the adoption of the Federal Constitution (1789) advocated a stronger central government, primarily as a safeguard for vested business interests. See Lodge, *Life and Letters of George Cabot* (1878).

Esslingen, town, province Neckar, Württemberg, Germany, manufactures machinery, cottons, lithographs, tin wares, wooden wares, etc. The town is famous for its wine and fruit. It possesses several old churches, including the Church of Our Lady (1324-1420), a 15th-century town hall, and an old citadel; p. 38,120.

Est, Canal de l', canal, 285 m. in length, begins at Givet, on the Belgian frontier, n.e. of France, and follows the valley of the Meuse s.e. through the depts. of Ardennes and Meuse until joined by the Canal de la Marne au Rhin. It then turns e. to Toul, after which it follows the valley of the Moselle in a s.e. direction through the depts. of Meurthe and Moselle. Northwest of Epinal it leaves the

Moselle, taking a s.w. direction to the Saône valley, which it traverses to Port-sur-Saône, in the dep. of Haute-Saône.

Estate. A term sometimes used to designate a political class. In the early Middle Ages political power was exercised mainly by the nobles and the clergy. Toward the close of the mediæval period, a third class or estate, the freemen of the self-governing towns, arose to claim a share in government; and early parliaments and representative assemblies were composed of these three estates. With the expansion of trade and industry, and the increasing dependence of government upon the monied classes, the power of the third estate augmented until, eventually, this class became virtually supreme, in England after the Revolution of 1688; in France after the French Revolution. The unskilled laborers in the towns and the small peasants in the country, are often called the fourth estate, especially in socialistic writings.

Estates. In law, the quantity, nature, or extent of interests in real and personal property. Estates in land are classified according to the nature of the interest into estates of freehold, and estates less than freehold. Freehold estates include ownership in fee simple, fees tail or conditional fees, and life estates. Estates less than freehold include estates for years and the very limited interests of tenants at will, and by sufferance. An estate in fee simple implies absolute ownership without restrictions, and such an estate descends to the owner's heirs if he dies intestate. A fee-tail is an estate which can only descend to a certain class of heirs, as to the owner's male heirs. In most of the United States, estates tail have been abolished.

Estates may be determined, or enlarged, by virtue of conditions inserted in the conveyance. The ownership of property may be vested in several persons, and their interests may be in common in joint tenancy, in coparcenary, by the entirety, according to the source and nature of their estates. An estate at will is, as the name indicates, one dependent upon the will of the landlord or owner. Very few of these exist to-day. An estate at sufferance implies a holding over by a tenant after his term has expired, but by statute to-day he may usually be held for another term of the same length. See DOWER; REVERSION; REMAINDER; LANDLORD AND TENANT.

Este, House of, an ancient N. Italian family, possessing fiefs in the districts of Padua, Ferrara, and the Polesin of Rovigo. Muratori traces them back to the early part of the 10th

century. It was they who founded the universities of Ferrara and Padua.

Esters, or **Ethereal Salts**, are the compounds formed when the hydrogen of acids is replaced by alkyls, and occupy the same position in organic chemistry that the salts do in inorganic. The manufacture of soap consists in the saponification of the fats, which are the palmitic, stearic, or oleic esters of glycerin.

Esther, **The Book of**, a book of the Old Testament, relates the story of a Jewish maiden, Esther or Hadassah, the adopted daughter of Mordecai, a Jew resident at the court of Ahasuerus, chosen as queen in the place of the repudiated Vashti; and tells how, by her influence, the machinations of Haman the Agagite, chief minister of Ahasuerus, against the Jews were brought to naught, he and his ten sons hanged, and some 75,000 other enemies of the chosen people slain, Mordecai being then exalted to the office of Haman. Consult Driver's *Introduction to the Literature of the Old Testament*.

Esthetics, see **Aesthetics**.

Esthonia, or **Estonia**, a republic of northern Europe, including the former Russian government of Estlant, the northern part of Livonia, the islands of Oesel, Dagö, and Muhamaa, and parts of Pskov and Petrograd governments. It has the Gulf of Finland on the north and the Baltic Sea on the west, and covers an area of 16,955 sq. m. The climate is generally temperate, but the winters are long and severe. Forests cover about one fifth of the surface. Agriculture is the chief industry, rye, wheat, barley, and potatoes being the leading crops. The people are mostly Lutherans. Esthonia became a republic in 1918 and adopted a constitution in 1920. The legislative power was in the hands of a State Assembly elected by direct, universal suffrage. The executive power rested with the State Head or Elder (Prime Minister) and ministers, who were chosen by the Assembly and were responsible to it. Reval is the capital; p. 1,109,479.

In Oct. 1939, Esthonia became practically a protectorate of Russia and a province of the Soviet Union in 1940. After bitter fighting Germany conquered the Russian forces in Esthonia in 1941 and occupied the country.

Estoppel, in law, the preclusion of a person from asserting or denying facts under certain circumstances, because his previous representations or conduct have been inconsistent therewith. Only parties to a transaction or their privies, that is, those who claim under or through them, can invoke the

doctrine against the other parties to the transaction. See **EVIDENCE**.

Estrella, **Serra da**, a mountain range of Portugal, stretching some 40 m. from n.e. to s.w., nearly midway between the Tagus and the Douro. It is mainly composed of granite. Its highest point is 6,540 ft.

Estremadura, province of Portugal in the western part, bordering on the Atlantic Ocean, with an area of 6,937 square miles. It includes the districts of Leiria, Lisbon, and Santerem.

Eszék, (Ger. *Esseg*), town, Yugoslavia, in Croatia-Slavonia, consists of a fortress and the upper, lower, and new towns. The upper town is the industrial center; p. 34,000.

Etawah, India, chief town of Etawah district, United Provinces, is picturesquely situated among ravines on the left bank of the Jumna; p. 46,000.

Etching. In the most limited sense an etching is a drawing scratched upon a metal plate, so that, when rubbed over with ink, an impression may be taken from it on paper. There are two methods of etching: first, that in which these scratchings are deepened by application of a corrosive acid; second, the 'dry-point,' in which no acid is used.

In line etching, the beauty of line is of first importance. In texture, the line is of secondary importance, the desire of the artist being to render texture and suggest color. The latter is necessarily the more difficult, the etcher being unable to judge of the effect of his work till a proof is taken. There are methods for lightening and darkening.

In dry-point a specially prepared etching-needle is used. The artist works directly on the plate without the use of either etching-ground or acid. Etchers often make use of the dry-point to touch up their plates.

Among modern etchers Whistler and Sir Seymour Haden stand alone. Interest in American etching, which died out in the '90s, has a decided revival in the present century. See Hind's *A History of Engraving and Etching from the 15th century to 1914* (1922); Laver's *A History of British and American Etching* (1929). Among the first rank of new graphic processes is the Offset Soft Ground, whereby the drawing is made with a conté crayon. The very soft black jelly-like substance called offset soft ground is applied with a brayer to a cold plate. This method has the advantage of enabling the artist to see the probable results as he works.

Photo-engraving plants have long been regularly using a method of rebiting. Briefly,

it consists of rolling onto the plate a thin layer of asphaltic substance into which is dusted the hardening element, resin. The two ingredients are baked together on the plate. This way of reworking an etching is claimed to make this agency of expression more plastic.

A modern etcher, Haden, has worked out a new plan whose benefits are already shown in the freshness and spontaneity of his own creations. Having immersed the grounded plate in the bath, he draws the lines in the order of the strength to be given them, until he completes the very finest, whereupon the plate is taken out.

In London the pen-method was revived in

Laver's *A History of British and American Etching* (1929).

Etching (of Crystals). If a natural crystal or a polished slice prepared from a crystal, be subjected to the gradual action of a solvent, it will usually be found that it has been attacked in a manner which is not uniform over its whole surface, but that irregular depressions have been formed. The symmetry of the 'etch figures,' as they are called, is very closely dependent on the crystallographic form of the crystal, and also on the nature of the face which has been attacked. The solvents usually employed are acids or caustic alkalis, but it is by no means uncommon to find naturally



Etching by Whistler: View of the Thames Tunnel Pier in 1874.

1936. And Henry Daniel, a Scottish etcher, recently discovered that oxo-chloride of bismuth is of excellent value in bringing line-work out in a light and a dark surface.

A number of artists are engaged in the development of color etching. Cattermole in reproducing the uniforms of the Scots Guards found it necessary to use water-color on his proofs. Colors like Tartan prove too complicated for plate printing.

In the spring of 1936 a memorial exhibition of the works of Ferdinand Smutzer of Vienna, who made the largest etchings in the world, was held in New York. Some of his prints are about three feet wide by four feet long.

The United States has shown a vigorous interest in etching ever since the time of James Abbott McNeill Whistler, but a large part of the work of her major artists in this field is done abroad. Included in the list of her notables are Herman J. Webster, Joseph Pennell, D. S. McLaughlin, Frank Weston Benson and Arthur W. Heintzelman. See

etched crystals. Etch figures are of great value to the crystallographer, and is the basis of much work in metallography.

Eteocles, in ancient Greek mythology, was the son of Œdipus, king of Thebes, by his incestuous marriage with Iocasta, his mother. See Æschylus's *Seven against Thebes*; Sophocles's *Œdipus Coloneus* and *Antigone*.

Eternity, Cape, a lofty headland on the Saguenay R., Canada. Its altitude is 1,700 ft. and the water at its base has a depth of nearly two-thirds that amount. Many tourists visit the locality.

Etesian Winds are northerly winds which blow on the Mediterranean during the summer months towards North Africa, to take the place of the heated air which rises from the Sahara and other African deserts, and carry the vapors of the Mediterranean across that country to the lofty Abyssinian mountains, where they condense in torrential rains, flooding the Nile.

Ethane (C_2H_6) occurs in coal gas and natural gas, and is a colorless, odorless gas, that

is insoluble in water, and burns in air with a somewhat luminous flame.

Ethelbert (?552-616), king of Kent. Converted to Christianity by Augustine (597), he influenced thousands of his subjects to become Christians, destroyed idolatrous temples, built and rebuilt churches, and also compiled the first written Saxon code of laws.

Etheldreda, Saint (?630-679), abbess of Ely, which she founded (673); she practised a severe asceticism, for which, and for her love of celibacy, she was canonized. Her name is perpetuated in the word *towdry*, from the character of the goods sold at the fair of St. Awdry—i.e. St. Etheldreda.

Ethelfleda (? d. 918), daughter of King Ælfred. As 'Lady of the Mercians,' and sole ruler on her husband's death (?912), she besieged and took Derby and Leicester, and finally made the Danes acknowledge her sway.

Ethelfrid (d. 617), king of the Northumbrians, spent his life in harrying the Britons, whom he overthrew at Chester (613).

Ethelred (?1109-1166), monk and historian, entered the Cistercian abbey of Rievaulx in Yorkshire, of which he became abbot (1146). He wrote a *Life* of Edward the Confessor.

Ethelred I. (d. 871), king of the W. Saxons and Kentishmen. Along with Ælfred he saved Mercia from the Danes.

Ethelred II. (?968-1016), king of England, 'the Unready.' His energy was largely spent in keeping off the Northmen. His brutal massacre of Danes (1002) in a time of peace renewed the invasions, which ended in the rule of Sweyn over all England (1013).

Ether, the name given to the medium which is said to fill space, and which may permeate matter. Light and similar forms of radiant energy are transmitted in all directions through the visible universe from body to body; and to give a satisfactory explanation of many optical phenomena, we are forced to regard the vibratory motion in ether which constitutes light as taking place at right angles to the direction in which the light is being propagated. (See **LIGHT**.) The whole question of the constitution of the ether entered upon a new and important phase with Faraday's discovery of the effect of magnetism on light, and the brilliant theory enunciated and developed by Maxwell, that light was an electromagnetic phenomenon.

The whole theory of the nature of matter, at present one of the chief subjects of investigation and discussion among scientists, thus becomes involved in the discussion of the ether, both as to its own properties or functions and

even as to its possible existence or non-existence. Judging from the present knowledge about the electro-magnetic nature of light that such a substance does exist, physicists turn to a study of the probable properties of this hypothetical substance which presumably fills space. They decide that it transmits every kind of radiation, notably light, to the farthest reaches of the known universe, without the least degree of interference; that it is the seat of all electrical and magnetic fields; and thus has a relation to all forms of chemical and physical activity. See also **EINSTEIN'S THEORY** and **MATTER**.

Ether, Ethyl Ether, or, as it is sometimes incorrectly called, **SULPHURIC ETHER** ($C_2H_5)_2O$, is prepared by the so-called 'continuous process,' in which five parts alcohol are mixed with nine parts sulphuric acid, and heated to a temperature of 140° C., ethyl hydrogen sulphate being formed. If then a slow stream of alcohol is run in, the ethyl hydrogen sulphate reacts with it, forming water and ether, which distils over, leaving sulphuric acid to continue the process. The product, after washing with caustic soda and water, separates into two layers, the lighter being dried with lime and redistilled. Ether is a colorless mobile liquid, lighter than water and has a peculiar smell. It is very volatile, boiling at 35.5° C., and is somewhat soluble in water. It is a good solvent for fats and resins, and is very inflammable, burning with a somewhat luminous flame, and forming an explosive mixture if its vapor is mixed with air. Chemically it is stable and not readily reactive. Besides the cooling action produced when it is evaporated by drawing air through it or under reduced pressure utilized in some freezing machines, its value as a solvent, and its use mixed with oxygen in the ether-oxygen burner for the limelight, ether is also largely employed in medicine. In this respect it is used in the following diverse ways: (1) To produce local anæsthesia by the freezing produced by its evaporation; (2) as a most effective and quick-acting heart stimulant, either when taken by the mouth or injected subcutaneously; and (3) as an anæsthetic when inhaled.

Ethers, or **Alkyl Oxides**, are a class of compounds that are related to the metallic oxides in the same way as the alcohols are to the hydroxides. They are prepared by the action of the alkyl halides on silver oxide, or of the alkyl hydrogen sulphate on the alcohol. The ethers in general are neutral bodies that vary from volatile liquids to waxy solids with rise of molecular weight. Chemically they are

inert, though by heating with acidified water they can be converted into alcohols. See ETHER.

Ethical Societies. Ethical societies are associations for the cultivation of character and moral principle without reference to the belief in God or a future life. The first 'Society for Ethical Culture' was founded in New York in 1876 by Professor Felix Adler, and in 1882, 1885, and 1886 three others were established in Chicago, Philadelphia, and St. Louis. There were founded also 12 in England, no less than 16 in Germany, and others in France, Austria, Italy, and Switzerland. See Felix Adler's *Creed and Deed* (1877) and *Life and Destiny* (1903); and Stanton Coit's *The Ethical Movement Defined* (1900).

Ethics. As a science of conduct, ethics investigates the nature of duty, and seeks to construct a consistent scheme of duties; as a science of character, it investigates the nature of virtue, and seeks to construct a consistent scheme of virtues. In the former aspect, it is the study of what man ought to do; in the latter, it is the science of what man ought to be. But since conduct is the expression of character, since duty presupposes virtue, the latter is the more adequate view of the problem of ethics. It is the characteristically Greek, as the other is the characteristically modern view. In both cases, however, we are led beyond the conception of oughtness to that of end or good. The question of ethics is not so much, What ought man to do and be? as, Why ought he to do and be what he ought to do and be? The ultimate question of ethics is, as the Greeks perceived, that of the chief end of human life.

In both ancient and modern ethics we find two main types of theory, which may be described as rationalism and hedonism respectively. Both are found in germ in Socrates, the founder of the science, who held that 'virtue is knowledge,' but found himself unable to explain the good, in the knowledge of which virtue consists, except in terms of pleasure. The virtuous life is for him at once the supremely rational and the supremely happy life. The immediate successors of Socrates, the Cynics and the Cyrenaics, affirm respectively the rationalistic and the hedonistic interpretation of morality, as do the Stoics and the Epicureans. For the Cynics and Stoics virtue or rationality is an end in itself, for the Cyrenaics and Epicureans it is only a means to an end better than itself—pleasure. These schools may be regarded as 'incomplete Socratics'; the complete Socratics are Plato and Aristotle. In

their writings we find the good interpreted in terms of rationalism rather than of hedonism. As regards the ethical value of pleasure, Plato in certain dialogues condemns it as unworthy of a rational being and the enemy of human good, but finally, like Aristotle, recognizes its right to a place in the best life, while still subordinating it to that activity of reason which it accompanies, and which alone has intrinsic worth. Both Plato and Aristotle, moreover, suggest a different and a more complete interpretation of the good, as consisting in the harmonious exercise of all the powers of human nature, through the subordination of all the others to reason.

Notwithstanding the close connection of ethics with politics, Greek conceptions of the moral ideal are always essentially individualistic; whether it is conceived as rational perfection or as happiness, it is a good of the individual life. In spite of their professedly Christian character, the ethics of the scholastic theologians are essentially individualistic, being in their basis Aristotelian, and adding in an external way the Christian to the cardinal virtues of the Greeks, and devoting their chief attention to the working out of the minute applications of moral law and the elaboration of a system of ecclesiastical jurisprudence. It remained for the modern moralists to attempt the solution of the problem of social or altruistic obligation, and the modern period begins with the effort to establish social morality on a non-theological basis. Thus the two chief types of ancient ethical theory reappear in a new form in modern ethics. On the one hand, we find ethical rationalism in the Cambridge Platonists, and in Kant; on the other hand, we find ethical naturalism and hedonism in Hobbes and his successors of the utilitarian school. In both schools we pass gradually from individualism to altruism; from an egoistic to an altruistic explanation of social obligation.

The ethical problem in the modern period assumes the form of an investigation into the validity of moral law, and the solution is attempted by tracing the law to its source.

That man is essentially a social being and the life of duty essentially unselfish is the common contention of contemporary evolutionary utilitarianism and of that ethical idealism which England has developed under the direct influence of German transcendentalism. The new and characteristically Christian element in the modern conception of self-realization is that of self-sacrifice or social service. The fuller recognition of this element in the good life which we find in the ethical theories of the

modern period, and especially in the theory of self-realization, has led to a revival of the ethical interest in the state, and to a closer connection between ethics and politics. Consult Kant's *Critique of Practical Reason*; Spencer's *Principles of Ethics*; Sidgwick's *History of Ethics*; Bradley's *Ethical Studies* (1927).

Ethiopia, official name for Abyssinia. See **Abyssinia**.

Ethiopia, 'the land of sunburnt faces,' a term used by the Greeks for the land of the Upper Nile, with Meroë as the capital of all the Ethiopians. The kingdom thus referred to was the country of Kash or Kesh (the Cush of the Bible), which was subject to Egypt, but in the 8th century B.C. became an independent monarchy, and for a time held possession of Egypt. The kingdom continued till the time of Augustus, when Candace submitted to the Romans. In the 4th century A.D. Meroë was ravaged by the Abyssinians and two centuries later the state of Nubia took its place.

Ethmoid Bone, in anatomy a bone of spongy substance somewhat irregularly cubical in shape, lying at the root of the nose, between the two orbits or eye-sockets.

Ethnology, a branch of anthropology which in American usage is distinguished from ethnography, archæology, physical anthropology, and linguistics. Ethnography is concerned with the description of the life and customs of living peoples, archæology with the remains of prehistoric civilizations, and physical anthropology with the biological character of races.

Ethnology is the analytic study of man's cultural behavior, that part of man's thought and activity determined by the customary activities of his racial, tribal, or national group. Hence it differs from psychology in scrutinizing his socially moulded actions rather than his individual reactions to personal situations.

The primary problems of ethnology have to do with ascertaining the mental patterns characteristic of the thought and behavior of the various nations and tribes, and the source and development of the customary social actions that constitute these patterns. For practical reasons, ethnologists confine their attention to primitive peoples, those without writing, dividing labor with the historian, sociologist, psychologist, and the like, who study the complex development of the historic civilized peoples.

One of the earliest observations of modern travellers was that the essential framework of human life even in remote parts of the globe was everywhere much the same. People everywhere provided themselves with some sort of

shelter, adorned their bodies, cooked their food, had domesticated at least the dog, recognized family ties, were welded by tribal organization, held some belief in a supernatural world, had languages with well defined, organized sounds, and so on. Frequently the similarities are many and quite specific.

Modern ethnologists agree on man's earlier career, although differing on the history of the later stages. All living men are thought to constitute a single animal species, of which the three races (Negroid, Caucasian, and Mongoloid) represent major divisions. Man seems to have had his origin in an extinct anthropoid ape (probably *Dryopithecus* of the middle Miocene period, two million years ago or more), and by the early Ice Age (Pleistocene, a million years ago or less) had become definitely human. Cultural remains (stone and bone tools) are known first from the last segment of the Ice Age, an antiquity of about 100,000 years. Man had his beginnings somewhere in the heart of the Old World land-mass, perhaps in southern Asia, and during the last 25-50,000 years of the Ice Age, spread at least throughout Eurasia and northern Africa. By the end of the Ice Age the modern races had split off and early in the following geological era (Recent, our own period) had spread into the remotest parts of Africa, Australia, the two Americas, and perhaps into the Pacific Islands. The only large uninhabited body of land at the opening of the period of European exploration was remote Iceland.

The older Stone Age (Palæolithic) is now known to have extended over Eurasia, except in the north, and perhaps over most of Africa, followed everywhere by the New Stone Age (Neolithic). But the Neolithic alone is known from Oceania and the New World. Metals took the place of Neolithic stone-working over much of the Old World. The use of bronze had its origin in the Near East and spread as far as Scandinavia and China; iron may first have been used in east Africa, spread throughout that continent, into Europe, and beyond the area of bronze tools into Japan and the East Indies. Oceania, Australia, and America never knew a Metal Age, nor have we reason to believe that they would ever have had one. The sequence of stone and metal ages in the Old World is now known to be the consequence of the spread of the stone- and metal-working arts, not the result of parallel development.

The ancient Europeans are known to have been tillers of the soil before they had domesticated herds. Our basic agricultural staples, such as wheat, were first cultivated in the

Egyptian-Mesopotamian zone; sheep and cattle were perhaps domesticated originally in central or southwestern Asia. Agriculture and pastoral life spread from these two centers. Hence the sequences of culture stages were the reverse in central Europe (agriculture-pasturage) and central Asia (pasturage-agriculture).

Several short-cuts to history have been proposed in broad schemes which attempt to summarize the relations of similar customs. Most important of these are the Pan-Egyptian school in England, the culture-horizon school of Germany-Austria, and the ultra-historical school in America. None of these schemes is wholly satisfactory.

The Pan-Egyptian school (of Elliot Smith and Perry) contend that much that passes for primitive culture is neither primitive nor ancient, but is the debris of archaic Egyptian civilization as diffused after the Sixth Dynasty. They maintain that from the Egyptian center there spread an early civilization involving sun-worship, erection of huge stone monuments, mummification of the dead, etc., carried by the 'Children of the Sun' coasting the seas in pursuit of lifegiving substances, such as gold and pearls. These customs reached all quarters of the globe although they subsequently degenerated or disappeared in many of the intervening regions.

In contrast the German-Austrian culture-horizon school (Graebner, Schmidt, Koppers) propounds a polygenetic scheme, in which several primary cultures above the hunting level developed independently and diffused on a wide scale, as, a horticultural civilization; an industrial hunting stage; and a pastoral culture. Relatively pure examples of these may be seen respectively in the Melanesians, Australian natives, and the Hebrews of Biblical times. The primeval hunting stage that preceded this is represented by various pygmy peoples.

The third historical scheme (Wissler, Kroeber) differs entirely from the preceding in its modesty. It maintains that higher civilizations can be traced in origin to relatively few points, from which they spread piecemeal over wide areas. Such foci of development were ancient Egypt and Mesopotamia, the Mediterranean lands, northern India, China, and Middle America. The scheme is undoubtedly valid in large part, but it gives too great a weight to the influence of these foci. To assume for example, that clan systems as far away as the Great Lakes and Georgia were derived from Middle America, ignores the formidable evidence brought forward to prove the several

independent origins of these clan systems, and ignores the awkward fact that clans are wholly unknown in Middle America.

On the other hand, ethnologists have made considerable progress in unravelling the history of native life, especially in North America. Thus, Southwest United States several thousand years ago, contained a nomadic population alone which was distributed from Nevada to Texas. Subsequently there appeared pottery, agriculture, and the building of small stone houses over a somewhat lesser area. Large pueblos of two types made their appearance about A.D. 1000 centering respectively in Northern New Mexico and Southern Arizona. The population then shifted to the upper Rio Grande where it was found by the Spanish explorers.

Thus as against general formulations the majority of American ethnologists, at least, are little concerned with historical reconstruction. Their attention is directed to the more fundamental problem: What are the factors that produce the mental patterns of the various groups of mankind? Substantial progress has been made in establishing certain concepts as of general application. A few of these are: the culture area and its problems, technological determinants, the culture complex, the tribal pattern, convergent evolution, and secondary association.

The culture area concept describes the fact that broad geographic areas are each characterized by a distinctive culture common to all the tribes within its bounds. The whole globe has been divided by ethnologists into a relatively small number of culture areas or distinctive types of life. For instance, about fifteen such areas are usually recognized as covering the two Americas. The limits reached by a particular culture area are fixed in part by geography, in part by historical and social factors. It is noteworthy that each culture area has specialized on one type of food production; as seed gathering, herding reindeer, cultivating corn, etc. This indicates that nature provides the materials; man decides what use will be made of them. Further, a tribe entering an area almost always loses its original culture and adopts the culture complex of its new neighbors. So that we find the same culture shared by contiguous tribes although they may speak quite unintelligible languages.

Social and historical factors are even more important in establishing the existence and limits of culture areas. A new fundamental economic technique, such as agriculture, may spread into neighboring culture areas where

previously hunting, fishing, and seed gathering habits prevailed. Thus at some remote period corn raising spread from its place of origin in southern Mexico north to the Great Lakes and south to Chili. Stone house construction, weaving, sandal wearing, a calendric series of ritual dances with which masks and altars were used, spread along the same routes but not so far. Archaeological evidence shows that the ancient Indians of Southwestern United States were a seed gathering, roving people before these arts reached them from the south. This region thus became part of an enlarged Mexican culture area. But a further change took place: there developed in that country a distinctive type of architecture (cliff-dwellings and pueblos), distinctive types of pottery and ceremonials. These in turn spread throughout the region and southward even into northern Mexico. There thus had arisen by the opening of historic times (the 16th century A.D.) a newly defined culture area, distinct from that of southern Mexico. The limits of this new area were set by the range of friendly intercourse, not by geography, since southern California and Nevada, while geographically one with Arizona-New Mexico, never acquired the native culture of the latter center.

Technological habits tend to follow a few simple forms, that is, certain actions become habitual and resistance is felt to establishing new ones. Thus, the south Siberian natives, on domesticating reindeer, used them for milking, driving, and riding in the manner of their cattle and horses. The peculiar designs developed in mat weaving in the Congo were applied by the same natives to wood carving and embroidery.

A pattern of thought and action comes to be established which pervades the whole life of the people. For example, the Indians of the lower Colorado River explain their own actions, as well as their view of the supernatural, as the result of dream experiences. So great an emphasis is put on the dream and song, that all other types of ceremonial activity, such as ritual dancing, are inhibited.

Patterns of yet another sort develop. Among many Indian tribes ritual acts are performed four times. It is by the development of ceremonial patterns that growth or elaboration of the tribal ritual largely takes place. More potent than the repetition pattern as a source of ritual growth is the common practice of adopting the ceremonies of neighboring tribes. Usually the dance movements and regalia are imitated without much change, but the organ-

ization of the dancers, the reasons for the performance, and the myths pertaining to it are radically transformed to the tribal pattern.

Patterns are by no means always ceremonial. They are often social, as is our own organization of daily activities on a seven day basis, although there is no such unit as the week in nature. Each day has for us its own peculiar duties and actions, prescribed by custom, which reoccur on the seventh day following.

It will be observed that the greater part of cultural life is carried on unconsciously. Inventions, crafts, and industries are more in consciousness than social behavior, ethical judgments, religious and artistic emotions, because the former have tangible, physical existence. It is undoubtedly for this reason that more progress has been made in the development of our machines, science, medical methods, and the like, than in our social relations and our ethics. The unconscious nature of much of culture is responsible to a profound degree for the character of its development. There is a tendency to amalgamate automatically things of quite distinct origin, and to reinterpret the old in terms of the new without scrutiny. Old habits persist but are given new values. Many modern churchgoers would hold that their devotional ritual has only symbolic value, forgetting that nevertheless the ancient ritual persists. They incline to stress the high ethical aims of religion and gloss over the emotional and dramatic appeal which were earlier among the primary reasons for church activities. Reinterpretation, unconscious or otherwise, tends to preserve the outward form of a culture intact although its spirit may suffer considerable transformation.

Another potent factor toward conservatism is the strong emotional reaction against change. Certain actions have become habitual with a people, and like all habits tend to be followed unthinkingly. A break with the conventional arouses surprise, emotion, and resistance. The more automatically the culture habit had been followed, the stronger the emotional reaction on its breach and the greater the resistance to change. Religion, patriotism, etiquette, propriety toward the dead, are some of the spheres in which this is especially true. It is astonishing how strong is our reaction against the taste of unfamiliar foods; all out of keeping with the biological necessity of survival value. It is notorious how in time of stress, as in war, any action contrary to that of the mob, no matter how well founded in reason, arouses a storm of passion.

Mental patterns that characterize the culture of each people are thus seen to be the result of an historic growth. The factors involved are multiform. In answer to the question as to how far men think and act alike, we can only hold that the basic mental operations and behavior are common to the whole of mankind, but the specific mode of thought is determined by the prevailing patterns, and these are the result of a complex culture history.

Consult Boas' *Mind of Primitive Man* (1911); Boas and others' *Anthropology in North America* (1915); Elliot Smith's *Migrations of Early Culture* (1915); Sapir's *Time Perspective in Aboriginal American Culture* (1916); Lowie's *Culture and Ethnology* (1918); Perry's *The Children of the Sun* (1923); Wissler's *Man and Culture* (1923); Malinowski's *Crime and Custom in Primitive Society* (1926); Marett's *The Diffusion of Culture* (1927); Smith and others' *Culture: the Diffusion Controversy* (1927); Dixon's *The Building of Cultures* (1928).

In May, 1936, in an address to the members of the National Academy of Sciences at Washington, Franz Boas summarized the result of 27 years study of physical changes in the descendants of immigrants. On this question the relative influence of environment on "racial" culture patterns is crucial. Dr. Boas stated that such "racial" features as stature, weight, bodily proportions, time of puberty, motor habits (gesture, etc.) change to conform with the change of environment. He saw no harm in an increased assimilation of alien peoples by the United States, and recommended racial inter-marriage as an aid to homogeneity and tolerance.

Ethyl, an alkyl, or organic radical, having the formula C_2H_5 , which, while not existing by itself, forms part of many compounds, such as common alcohol, in which it is united to OH, etc.

Ethyl Chloride (C_2H_5Cl) is obtained by passing hydrogen chloride gas into alcohol containing a small quantity of zinc chloride, and heating. The product is a very volatile, somewhat sweet-smelling liquid. It burns with a green-edged flame.

Ethylene (C_2H_4), or 'olefant gas,' is a hydro-carbon gas made by heating common alcohol with an excess of sulphuric acid. Ethylene is a colorless gas with a slight ethereal odor. It is insoluble in water, and burns with a very luminous flame, forming carbon dioxide and water. It unites directly with an equal volume of chlorine to form 'Dutch

liquid,' or ethylene chloride, and is the component of ordinary coal gas, to which the luminosity of the latter is largely due.

Etiology, theory of causation—in medicine the etiology of a disease is the theory of the causes by which it is induced. For the theory of causation in general, see CAUSE.

Etiquette, in former times 'etiquette' signified the ticket affixed to bundles to denote their contents, a bundle thus labelled passing unchallenged. From this it came to mean the conventional rules of personal behavior observed in the intercourse of polite society, as also the unwritten code of honor by which members of certain professions are prohibited from doing things deemed likely to injure the interests of their brethren, or to lower the dignity of the profession.

Etive, river and sea-loch, Scotland, on the west coast of Argyllshire. The river is 15 m. long, and falls into the head of the loch. Ardochattan Priory (1281) is a fine and interesting ruin on the north shore.

Etna, a volcanic mountain close to the eastern coast of Sicily. It is an almost circular, flattened cone, measuring about 100 m. in circumference at the base, and rising to an altitude of 10,750 ft. The crater wall has been broken down on the east side only, leaving a chasm 2,000 to 4,000 ft. deep. The mountain is dotted over with large secondary cones. Its lower slopes, especially towards the southeast, are exceptionally fertile, well cultivated, and densely inhabited; but above 7,000 ft. all is black and barren. An observatory has been built at the foot of the capping cone of ashes, some 1,100 ft. from the summit. Eruptions take place on an average after intervals of four or five years. The ancients attributed the mountain's outbreaks to the giant Enceladus, or Typhoeus, and held it sacred to Hephaestus. Ancient legend also made it the scene of the myths of Acis and Galatea, Demeter and Persephone, Polyphemus and the Cyclopes. Destructive outbreaks occurred in 1169, 1669, 1693, 1792, 1879, 1886, 1911, and 1928, when the destruction amounted to about \$10,000,000. The native Sicilians call the mountain 'Mongibello.'

Eton College, one of the most famous educational establishments in England, was founded in 1440 by Henry VI. The teaching comprises classical and modern subjects and the faculty is a large one. The total number of pupils exceeds 1000.

The college buildings are of various dates and are very beautiful. The 'Montem,' or triennial procession to Salt Hill (*ad montem*),

was celebrated last in 1844. Consult Maxwell Lyte's *History of Eton College*.

Etruria, called also Tuscia by the Romans, and Tyrrhenia or Tyrsenia by the Greeks, an ancient country in Central Italy. It was bounded on the east and south by the river Tiber, on the west by the Mediterranean Sea, and on the north and northwest by the Apennines and the river Macra. The origin and racial character of the Etruscan people are very uncertain. The ancients believed that they were immigrants from Lydia; modern writers have held that they were a Rætian race from the Alps. Though a number of Etruscan inscriptions have been discovered, they have never been deciphered. It is, however, certain that up to about 500 B.C. the Etruscans formed the most powerful state in Italy, holding not only Etruria, but also the valley of the Po. From the latter they were expelled by the Gauls, who destroyed Melpum, one of their chief cities, probably in the 6th or 5th century B.C.

The Etruscans were a highly artistic people, as their monuments testify. It is beyond doubt that the rule of the Tarquins at Rome was really a conquest of Rome by the Etrurians. But about 500 B.C. their power declined, owing to the pressure of the Gauls on the north, the rivalry of Carthage and the Sicilian Greeks at sea—in 474 Hiero of Syracuse defeated them in a great sea-battle—and the growth of the power of Rome. Many wars were waged between the Etruscans and the Romans, the first great success of Rome being the destruction of Veii in 396 B.C. The Etruscans were finally subdued in 282, and received the Roman franchise in 90 B.C., after which they became merged in the Roman nation, though they influenced the Romans largely in matters of religious, political, and social life. Etruria now forms the greater part of Tuscany and part of Umbria. Consult Ridgeway's *Early Age of Greece*; Dennis' *Cities and Cemeteries of Etruria*.

Ettrick, a river and district, Scotland, in Selkirkshire. Near the source of the river is the village of Ettrick, in the churchyard of which are buried Boston (1676-1732), the author of *The Fourfold State*, and Hogg (1770-1835), the 'Ettrick Shepherd.' Now it is treeless, and forms sheep-walks. It was a favorite hunting-ground of the Scottish kings until the time of James V.

Etty, William (1787-1849), English painter. In 1811 his *Sappho* was hung in the Royal Institution, and his *Telemachus rescuing Antiope* found a place on the walls of the Royal Academy. In 1820 he produced *Pandora*, followed

by *The Coral-finders* and *Cleopatra's Arrival in Cilicia*. Soon after he began a series of large subjects—*Woman pleading for the Vanquished* (1825), three scenes from the history of Judith (1827-31), and *Beneath* (1829). Among his other chief works are *Youth at the Prow and Pleasure at the Helm* (1832); *The Sirens* (1837); and three subjects from the career of Joan of Arc. As a colorist Etty ranks high. His painting of flesh is distinguished by delicacy, and refinement, and the glowing, blending hues of his draperies and of his landscape backgrounds are in admirable harmony with his figures.

Etymologicum Magnum, a Byzantine Greek lexicon, the authorship of which is unknown. Dr. Gaisford bestowed immense labor on an edition which he published at Oxford in 1848.

Etymology, that branch of science which traces the history of the meanings and forms of words. It traces the origin and development of the pronunciation, spelling, and signification of individual words. There must be a known channel of communication through which the borrowed word may be assumed to have come. Etymology endeavors to arrange the meanings of each word genealogically, and to find out, if possible, what the first or primary meaning was.

It cannot be too often repeated that the oldest ascertainable form of the name is invariably to be taken as the starting-point of an explanation. The history of the district or country, and perhaps one of the elements of the name, may serve to suggest the language from which the word is derived. Obscure resemblances are made clear by a knowledge of the laws of phonetic change. Place-names are generally a designation of some prominent feature in the locality; its survival, or some record of its former existence, is frequently evidence of the soundness of an etymology. Popular etymologies show a marked tendency to explain place-names by incidents; the stories upon which they are based are generally spun out of chance resemblances between the name and a suggestive catch-word. Consult Trench's *On the Study of Words*; the larger standard dictionaries; Skeat's *Concise Etymological Dictionary*.

Eubœa, **Egripos**, or **Negroponte** (Ital 'black bridge'), the largest island of Greece in the Ægean Sea, is 115 m. long, with a maximum breadth of 33 m. It is generally mountainous, highest peaks, St. Elias, 4,840 ft., and Delphi, 5,725 ft., but has many fertile valleys. During most of the 5th century B.C.

the island belonged to Athens. Its subjugation by Philip of Macedonia (338 B.C.), its possession by the Venetians (1351), its conquest by the Turks (1470), its desperate but unsuccessful attempts to regain its independence (1688), and its incorporation (1830) in the kingdom of Greece are the chief landmarks in its history; p. 143,052.

Eubulus, the leading statesman at Athens about 350 B.C. He was an able financier, and, as a statesman, a supporter of peace, and so opposed to Demosthenes and the anti-Macedonian party.

moved from the trees and cured, are used for flooring and thatching. The bark of the various 'gums' exudes a resin, 'kino,' used for tanning, and an antiseptic oil, used in dentistry and medicine, is taken from the aromatic leaves of certain species.

The aromatic Blue Gum is the species most commonly planted for its flowers, for its value as a shade tree in countries liable to long droughts, and for its propensity to absorb the superfluous moisture of swampy and malarial districts. The trees grow rapidly, reaching a height of more than 300 ft., and have been



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Mount Etna, Showing Catania at the Foot of the Mountain.

Eucaïne, a locally anæsthetic drug, comparable to cocaine in many of its qualities, but said to be less toxic and more active. Two eucaïnes are manufactured—eucaïne *a*, and eucaïne *B*.

Eucalyptus, a genus of evergreen trees of the family *Myrtaceæ*. They are chiefly Australian and are known as gums, iron-barks, stringy-barks, jarrah, etc. They have peculiar leaves, which, on the older shoots, present their upper edges to the sky. The 'blue gum' has a bark as smooth as glass; some of the species have barks so hard and persistent, that 'iron-bark' seems to be the most natural name for them; others, the 'stringy-barks,' shed their bark in long strips which swing lugubriously in the winter winds, but when properly re-

extensively planted in Southern Europe and in California. Its wood is hard and durable and often replaces oak and hickory. The oil obtained from its leaves is used medicinally.

Jarrah wood resembles mahogany, and is valuable for ship and wharf-building as it resists the attacks of the marine wood-borer and the white ant. It is brittle under moderate pressure, but when properly felled and seasoned, it withstands exposure, and has been used for railroad ties and telegraph poles.

Eucharis, a genus of tropical plants belonging to the *Amaryllidaceæ*. They are bulbous plants having broad, ovate leaves and umbels of showy white flowers of great beauty and fragrance. The best known species is the Amazon Lily, also known as Star of Bethlehem.

Eucharist, the Christian offering of praise and thanksgiving in which is 'shown forth the Lord's death till He come.' It is the central rite of the church, the observance of which is based upon the direct command of Christ. Around no doctrine of the church has more controversy raged. From the Roman doctrine of transubstantiation to the 'breaking of bread' of the Plymouth Brethren, every grade of opinion has been held and fought over. The institution will be found in the synoptic gospels and in the First Epistle to the Corinthians.

The rite is deeply symbolic in every particular. It consists in the consecration of bread and wine; in the breaking of the bread and pouring of the wine into a cup; in the solemn partaking of the elements by the communicants.

The term Eucharist, or 'thanksgiving,' is that by which the rite was earliest and most commonly known; the rite is also termed the Lord's Supper, and this expression is used both by Chrysostom and Augustine and in the English Book of Common Prayer. The symbolism of an ordinary meal is thus raised into sacramental importance. The Holy Communion is another commonly used term. The expression forcibly reminds the participant that 'we being many are one bread and one body, for we are all partakers of that One Bread.'

The term Oblation, or 'offering' is also applied by comparatively early writers to the offering of the Eucharist itself. The word, however, meant originally the presentation of the 'alms and oblations' upon the holy table. The Book of Common Prayer refers to the actual death of Christ as 'a full, perfect, and sufficient sacrifice, oblation, and satisfaction for the sins of the whole world'; and further links the idea contained in the word to that of the act whereby 'we offer and present ourselves' in the Holy Communion.

Both the word Sacrifice and the meaning implied by it are common to the earliest writers. The term 'unbloody sacrifice' was used to distinguish the Eucharist from the sacrifices of the Old Testament. The symbolism of both has a similar import. The sacrifices of the Old Testament pointed forward to the death of Christ; the sacrifice of the New Testament points back at the same supreme act, and 'shows the Lord's death till he come.'

Another familiar name for the Eucharist is the Sacrament. The term was early used, and shows that 'an analogy was soon observed between the Holy Communion and the *sacra-*

mentum, or military oath by which the secular armies of the Roman empire were bound together in one body.' St. Augustine says, 'They are therefore called sacraments because in them one thing is seen, another understood.' That is to say, they are symbolic of the sacred bonds which exist between God and man.

The term Mass is used in the Roman communion, and by a certain school of Anglican churchmen, to signify the Eucharist. St. Thomas Aquinas also explains the word to mean that the Eucharist has been *sent up* to God. The term Mass has been generally discarded by the reformed churches, as implying the Roman Catholic doctrine usually associated with it.

As to the time for the celebration of the Eucharist, there is no doubt that this was, for a short while, in the evening. (1 Cor. xi. 17-34; Acts xx. 7). There may have been a special reason for this so long as Christian rites necessarily were observed as quietly and unostentatiously as possible, so as not to attract hostile attention. Cyprian explains why it behoved Christ to institute the Sacrament at the evening of the day, 'to intimate the setting and evening of the world . . . but we celebrate the resurrection of the Lord *in the morning*.' The morning hour was, without doubt, associated with the doctrine of fasting before participation. St. Augustine admits that the disciples who first received the Sacrament did not receive it fasting, but 'it seemed good to the Holy Ghost that, for the honor of so great a sacrament the Lord's body and blood should enter the Christian's mouth before other food.'

As to the most usual day for the observance of the rite, the Roman Catholic Church counsels a daily celebration on the part of all her priests. The English Book of Common Prayer directs that 'every parishioner shall communicate at least three times in the year, of which Easter shall be one.'

While the teaching of the real presence was apparently universal at an early date, the Roman doctrine of transubstantiation was not adopted finally until the fourth Lateran Council, in 1215; this was confirmed by the Council of Trent. The cup was not withheld from the laity till the 12th century; but both this and the substitution of a wafer for bread were the inevitable result of that fear expressed by Tertullian, 'We are full of anxiety lest anything of our chalice and bread should fall on the ground.' In the Protestant churches both the bread and the wine are partaken of by the communicants, and the rite is generally viewed as entirely symbolic. See CONSUBSTANTIATION.

TION; TRANSUBSTANTIATION. Consult Stone's *History of the Doctrine of the Holy Eucharist* (2 vols.).

Eucharistic Congresses. See INTERNATIONAL EUCCHARISTIC CONGRESSES.

Euchre, a game of cards, a modified form of écarté. It is played with a pack of thirty-two cards—all cards between the seven and the ace being discarded—by two, three or four persons; a modified game, known as 'six-handed euchre,' is also played. The players having cut for deal, the player to the dealer's right cuts. The dealer then gives five cards to each player, two at a time, and then three at a time, or *vice versa*, and turns up the next card for trump, placing it face upward on the top of the pack. The cards in suits, except trumps, rank as in whist, the ace being highest and the seven lowest. In the trump suit the knave, called the *right bower*, ranks highest, and the other knave of the same color (black or red), called the *left bower*, next highest, followed in order by the ace, king, queen, ten, nine, eight, and seven of trumps. Sometimes a 'joker' or blank card, which is considered the highest of all trumps, is introduced into the pack.

After the trump is turned up, each player has in turn the chance to say whether it shall remain or to choose another; if he does not care one way or the other, he says 'I pass.' If all pass, the dealer must decide; he may 'turn down' the trump and 'make' a new trump, or may discard one card from his hand and take up the trump card. After the trump card has been taken in hand, no player has a right to demand its denomination; but he may ask for the trump suit, and the dealer must inform him. The regulations in regard to misdeals, revoking, exposed cards, etc., are similar to those of whist.

A game consists of five points. If the side which adopts or makes a trump takes five tricks, it scores a 'march' or two points; three or four tricks, it scores one point. If it fails to take three tricks, it is *euchred*, and the opposing party scores two points.

Four-handed euchre is usually played by partners who sit opposite each other, but if a player wishes he can 'play it alone'; his partner laying down his cards. In this case the scoring is somewhat different, a 'march' counting four, and three or more tricks one.

Euchlorine is a yellow gas first prepared by Davy by heating potassium chlorate with hydrochloric acid, and believed by him to be a definite compound. It has a peculiar odor and powerful oxidizing action, and is now

known to be a variable mixture of chlorine and chlorine peroxide.

Eucken, Rudolf (1846-1926), German philosopher, was born in Aurich, East Friesland. He received the Nobel Prize for literature in 1908. In 1912-13 he was Exchange Professor at Harvard University. Eucken is an idealist, the central point of his system being the spiritual life, which in its absolute manifestation is God. The individual attains spiritual life through the conquest of the opposing forces of evil, and makes the past live in the present by freely appropriating from it whatever is of avail to him in the struggle. To this spiritual life of action, not contemplation, Eucken has given the name 'activism.' Among his works are *Christianity and the New Idealism* (1909); *The Meaning and Value of Life* (1909); *Collected Essays* (1914); *Socialism: an Analysis* (1921); *The Spiritual Outlook of Europe Today* (1922).

Consult Kappstein's *Rudolph Eucken* (1909); Kessler's *Rudolph Eucken's Work* (1911); Tudor Jones' *An Interpretation of Rudolf Eucken's Philosophy* (1912); *Rudolf Eucken: His Life, Work and Travels, by Himself* (1921).

Euclase (HBeAlSiO₅), a rare mineral, resembling emerald, composed of silicate of aluminum and glucinum, and occurring in monoclinic crystals. It is found in Brazil, Orenburg, and Austria. It is sometimes known as 'prismatic emerald.'

Euclid, ancient mathematician who flourished in Alexandria during the reign of the first Ptolemy (B.C. 305-285). Euclid's most famous work is the *Elements of Geometry*, in thirteen books, to which two were subsequently added—probably by Hypsicles of Alexandria. Some of the propositions were known before Euclid's time, and it is impossible to say what proportion of the work is absolutely original. Euclid was also the author of the *Data*, *Divisions of Superficies*, treatises on *Harmony*, *Optics* and *Catoptrics*, the *Phenomena* (celestial), etc., besides a work on *Porisms*, and others now lost. Consult Thomas Smith's *Euclid: His Life and System*.

Euclides of Megara, a Greek philosopher of the 4th century B.C., was one of the pupils of Socrates. After Socrates' execution, in 399 B.C., he took refuge in Megara, where he established a school of philosophy, combining the Eleatic principles with the ethics and dialectical method of Socrates. Consult Ueberweg's *History of Philosophy* (Eng. trans.); Gomperz' *Greek Thinkers*.

Eucomis, a genus of bulbous liliaceous plants, natives of South Africa, characterized

by a rosette of long radical leaves, from the center of which proceeds, in late summer, a sturdy spike of greenish flowers surmounted by a canopy of leaf-like bracts.

Eudæmonism, a word adapted from the Greek, and meaning happiness or well-being, which in Aristotle's ethics is the most general expression for the nature of the chief good. Consult Seth's *Study of Ethical Principles*.

Eudiometer, an apparatus used in the analysis of gases, and especially in determining the quantity of a particular gas in a gaseous mixture. The broad principle is to remove that particular gas by chemical action of a known reagent, and then calculate how much has been removed by observing the change of volume.

Eudists, a Roman Catholic order founded by Jean Eudes (1601-80) in 1643 for educational and missionary purposes, was composed of priests and lay brothers, and administered under the authority of the bishops. At the outbreak of the French Revolution the order was suppressed; but it was reorganized in 1826, and flourished in France until the application of the Associations Law of 1906.

Eudocia, or **Athenais** (401-460), the daughter of the Athenian sophist Leontios, and wife of Theodosius II. She wrote, or rewrote, a *Life of Jesus* in hexameters, paraphrases of books of Scripture, a poem on her husband's victory over the Persians, and a poem on St. Cyprian. Consult Gregorovius' *Athenais*.

Eudoxus of Cnidus (c. 407-355 B.C.), astronomer and geometer, founded a school at Cyzicus, and later at Athens.

Euganean Hills, a range of volcanic hills in the plain of the Po in North Italy; 10 m. s.w. of Padua.

Eugene, city, Oregon, county seat of Lane co., at the head of navigation on the Willamette River. The University of Oregon is located here. The chief industries are the manufacture of lumber, flour, woolen goods, soap, soda, and ice; and there are foundries, sash and door factories, and brick yards; p. 20,838.

Eugene, Prince (1663-1736), whose full name was FRANÇOIS EUGENE, PRINCE DE SAVOIE, was the fifth son of the Count of Soissons and was born in Paris. After 1683 he served with distinction for the Holy Roman Empire and its allies against the Turks and Hungarians. During the War of the Spanish Succession he was in active command in Italy, in Hungary, in Germany, and in the Netherlands, his best-known deeds being the victory

of Blenheim, 1704, in which he co-operated with Marlborough, and the victory at Turin in 1706.

In 1716 the emperor entered upon a war with Turkey, in defence of Venice. Eugene's brilliant victory at Peterwardein followed by the capture of Belgrade, and other successes, led to the Peace of Passarowitz, July, 1718, by which the empire secured great territorial advantages. He displayed foresight in declining the crown of Poland, and in his resistance to the demand of the elector of Brandenburg for the title of king. He showed similar sagacity in consistently supporting an alliance with England and Holland. Consult Malletson's *Prince Eugene of Savoy*; Würdigs' *Prince Eugene*.

Eugenia, a genus of tropical evergreen trees and shrubs belonging to the Myrtaceæ. They produce whitish flowers, followed by globular, one-seeded berries.

Eugénie, Marie Ignace Augustine de Guzman (1826-1920), Empress of the French, was born in Granada, the daughter of Count di Montijo and Maria Kirkpatrick, of Scottish descent. She became the wife of Napoleon III. Eugénie exerted a great influence over the Emperor, and the court of the Tuileries owed much of its brilliance to her social gifts. Consult the autobiographical *Some Recollections from My Life*; Stoddart's *Life of the Empress Eugénie*; Legge's *Empress Eugénie*; Fleury's *Memoirs of the Empress Eugénie*.

Eugenics, the science which deals with the influences that improve the inborn qualities of a race. It takes into consideration the theories of natural inheritance, variation, selection, regression, etc.; and by scientifically tracing these fundamental elements through the life histories of generations of families, it endeavors to arrive at a satisfactory method of improving generally the mental and physical development of mankind.

For countless ages man has been engaged in the domestication and breeding of plants and animals. Sooner or later, men were bound to ask why human stock might not be improved. It may seem strange that this should have been so long delayed; but man, unlike the lower animals, has had to be his own domesticator.

Most important of all factors has been the development of biology. The older students thought of the human body as a unit. They knew that reproduction took place only through the germ cells, but supposed that in some way any change for good or bad in the

body cells was reflected by a corresponding change in the germ cells.

About 1890, Weismann uttered his epoch-making assertion that changes in the body cells cause no changes in germ cells. A bitter controversy arose, but to-day there is general agreement that acquired characters are not transmitted. Long before this, Mendel in the monastery at Brinn, Austria, had cultivated sweet peas, and had shown that in each plant there was a series of 'unit characters' which were separately inherited, and which could be combined in various groups. In a word, the entire organism was not one unit.



The Empress Eugénie

To understand this, a word relative to the germ cell is necessary. A microscopic examination of a cell of the human body will show a central nucleus surrounded by a watery fluid. If this nucleus be stained, there will appear twenty-four lines which are called chromosomes. In the mature germ cell there are but twelve chromosomes, the others having been thrown off in non-functioning polar bodies. There is considerable doubt as to the exact number of the chromosomes, some observers putting them as high as forty-eight. Thus, when the sperm unites with the ovum each furnishes half of the necessary units, and makes possible the growth of a new being. These chromosomes, therefore, are generally considered to be the carriers of heredity. Each chromosome is thought of as containing the 'determiners' of many units.

No one knows to-day the exact number of

unit characters in the human being, nor their behavior, but our knowledge is growing daily. We do not know much, as yet, nor is much known about the various characters, as to whether they are dominants or recessives. These phenomena are called 'Mendelian,' and apparently are determined solely by the law of mathematical probability. One problem of the present, therefore, is to determine which of the human units follow the Mendelian law—which are recessive, which dominant. For general purposes, the eugenics movement may be divided into Negative and Positive.

Negative Eugenics means preventing the unfit from becoming parents. It is evident that to-day no committee can be trusted to draw the line between the fit and unfit; and it seems clear that increasing knowledge will always result in a shifting of any such lines. Yet by common consent, there are some individuals or classes utterly unfit for parenthood—notably the feeble-minded. That feeble-mindedness is hereditary has long been known; but the degree to which this is true was not known, nor was the number of the feeble-minded appreciated, for the higher types were generally unrecognized. Hence the marriage of the feeble-minded must be prevented. A number of States have prohibited such marriages, and others will probably soon do so.

Insanity is a term covering many different conditions. Much insanity is due to drink, disease, and worry; yet it seems so certain that some forms are hereditary that certain States prohibit the marriage of those who have been insane within five years. Because of the easy transmission of some diseases, such as syphilis, from parent to child, the eugenicist argues that the prohibition should be extended to them. The same will probably be found to apply to alcoholics as the direct effects of alcohol upon the germ cell become better known. In addition to these generally recognized defectives, there is a vast army having other defects—deaf mutes, those with extra fingers, albinos, the choraic—whose family charts need careful study. In various sections of the United States, deaf mutism, Huntington's chorea, hæmophilia ('bleeding') have been located in foco, from which they have spread over large areas. As knowledge grows, public sentiment will object to marriage on the part of those having such traits, on account of the burden of support placed on the public. Negative eugenics, then, will result in the prohibition of marriage to those deemed unfit, and will require a physical certificate of those contemplating marriage.

Positive Eugenics is far less advanced. No one can compute the value to society of Darwin, Beethoven, Marconi, or Edison. Yet if one were to select in each of these men the unit characters which he wished reproduced, it should be remembered that on a basis of mathematical probability there would be about one chance in a million of getting the desired combination. Just here another problem arises. How many of the big men of history have really been of markedly superior gifts? How many have been good average men with exceptional opportunity? It is idle to discuss the relative importance of environment and heredity—of nature and nurture. No one can decide the relative importance of two essentials. It is one's business to learn what factors come through heredity, what through the environment. The danger of the biologist is that he will forget environment in his emphasis upon heredity; the ethnologist's tendency is the reverse. As previously stated, there is no large, well-organized eugenist movement. Rather it is a growing sentiment shared by many who are involved in questions of human welfare.

The first International Eugenics Conference was held at London in August, 1912, and was attended by people from many lands. In addition to the works already mentioned, consult Karl Pearson's *Groundwork of Eugenics* (1909); Sir Francis Galton's *Natural Inheritance* (1889); Darbyshire's *Breeding and the Mendelian Discovery* (1910); T. H. Morgan's *Heredity and Sex* (1913); L. Darwin's *The Need for Eugenic Reform* (1926); E. M. East's *Heredity and Human Affairs* (1927); George Whitehead's *An Outline of Eugenics* (1929); W. E. Castle's *Genetics and Eugenics* (1930).

Eugenius, the name of four Popes:—

EUGENIUS I., SAINT (654-57), was chosen to succeed Martin I. He attempted, without success, to reconcile the Eastern and Western churches, divided over the Monothelite controversy.

EUGENIUS II. (824-27) signed a political concordat with the Emperor, Louis the Pious (824).

EUGENIUS III. (1145-53), was a disciple of St. Bernard of Clairvaux, whose letters to him are of great interest. He made the appeal for the second crusade.

EUGENIUS IV. (1431-47) carried on with the Council of Bâle a struggle that ended in a papal triumph. Consult Creighton's *History of the Papacy* (1903).

Eugenol ($C_8H_8(OH)OCH_3 \cdot C_3H_5$), the chief constituent of oil of cloves, and occurring also

in calamus oil, oil of nutmeg, and oils from cinnamon, sassafras, and bay leaves. On oxidation with potassium permanganate it yields homo-vanillin, vanillic acid, and vanillin, the odorous principle of vanilla.

Eugubine, or **Iguvine Tables**, seven tablets of brass engraved with inscriptions in ancient Umbrian, discovered in 1444 in a ruined theater near Gubbio in Central Italy, and now preserved there. They are of the highest possible importance for the study of the early languages of Italy. There are 447 lines, read from right to left, partly in Roman, mainly in Etruscan characters; but the language is Umbrian throughout. For three hundred years their meaning remained unknown. O. Müller first proved the language not to be Etruscan; and Aufrecht and Kirchhoff finally solved the problem. The tables contain the acts of a corporation of priests, twelve in number, called the Attidian Brethren. Consult F. W. Newman's *Text of the Iguvine Inscriptions*; Conway's *Italic Dialects*.

Euhemerus and **Euhemerism**. Euhemerus of Messene was a Sicilian Greek. About 316 B.C. he was at the court of Cassander in Macedonia, by whom he was sent on an exploring expedition down the Red Sea and along the southern coasts of Asia. After his return he published a work called *The Sacred History*, which he professed to base on his discoveries in the island of Panchæa. Its main proposition was that all the gods were merely men who had in their time been distinguished as warriors, inventors, or benefactors of mankind, and who had therefore been deified. He applied this method of interpretation to all the Greek mythology.

From Euhemerus this method of criticism of legends has been called Euhemerism. Its strength, as a general principle, lies in the fact that all races have a tendency to deify their heroes, whose qualities become magnified with the lapse of time. The chief modern exponent of this method of interpretation was the Abbé Banier, in the 18th century. Consult Taylor's *Primitive Culture*; Block's *Euhémère et sa Doctrine*; Blas' *Quæstiones Euhemeræ* (Dissertation, University of Amsterdam, 1902).

Eulenburg, Botho, Count (1831-1912), German statesman, born in Wicken, Friesland. He was educated at the Universities of Königsberg and Bonn (1849-52). He served as a member of the Prussian Lower House (1863-70 and 1879-81), Minister of the Interior (1878-81), and president of the Prussian ministry (1892-4). In 1899 he took his seat in the Prussian House of Lords. He was Knight

of the Orders of the Black Eagle and of the Prussian Crown.

Eulenspiegel, Till, seems to have been a peasant from Kneitlingen in Brunswick, who died at Mölln, near Lübeck, in 1350. The earliest editions of his *Jests* were in Low German, of the years 1483, 1490, 1500, approximately. This collection of jests was one of the most popular books of the 16th century. De Coster's book on the legend, first published in 1867, and reissued in an enlarged form in 1893, is of considerable value.

Euler, Leonhard (1707-83), Swiss mathematician, was born in Basel. In 1741 he went to Berlin, at the invitation of Frederick the Great, to assist in founding an academy there. His name is perpetuated in various mathematical formulæ. Among his works are the *Introduction to Algebra* (1770) and *Lettres à une Princesse d'Allemagne*. Consult Rudio's *Leonhard Euler*.

Eulophia, a genus of terrestrial orchids belonging to the Vandeeæ.

Eumæus was the faithful swineherd of Odysseus in Greek story. Consult Homer's *Odyssey*.

Eumenes of Cardia was the private secretary of Philip of Macedon and Alexander the Great. On the death of the latter he became ruler of Cappadocia, Paphlagonia, and Pontus in 323 B.C.

Eumenes I., king of Pergamus in Asia, from 263 to 241 B.C.—**EUMENES II.**, king of Pergamus from 197 to 159 B.C. He allied himself with the Romans, and under his rule Pergamus attained to great prosperity.

Eumenides (also called ERINYES by the Greeks, and FURIAE and DIRAE by the Romans) were in ancient mythology the avenging deities. *Æschylus'* play *Eumenides* gives a vivid account of them.

Eumolpus, in Greek mythology, was a Thracian poet, the son of Poseidon. He was held to have founded the Eleusinian mysteries; and his descendants, the Eumolpidæ, were the priests of Demeter at Eleusis till the latest times.

Eunomius (d. 394), was born in Dacora, Cappadocia. In the year 360 he was appointed bishop of Cyzicus, but was deposed four years later, in consequence of extreme Arian views, and afterward banished by the Emperor Theodosius. His *Apologies* have been recovered from the refutations of Basilius and Gregory of Nyssa.

Eunuch, a man rendered incapable of sexual reproduction by means of a surgical operation. From the Egyptian and Babylonian period to

the present day, Oriental potentates have been accustomed to put their women under the charge of eunuchs, a custom which was adopted also by the later Roman emperors.

In modern Europe eunuchs were, till recently, in demand as singers; this was only put a stop to when Pope Leo XIII., on his accession (1878), prohibited the employment of *castrati* in the papal choir. See CASTRATION.

Euomphalus, a genus of fossil gasteropod shells, mostly flattened and disc-shaped, with a wide and open depression or umbilicus on the under surface.

Euonymin, an extract from the bark of the wahoo or spindle tree (*Euonymus atropurpureus*), is used medicinally as a powerful stimulant to the liver, with a mild cathartic action on the intestine.

Euonymus, a genus of trees and shrubs belonging to the Celastrineæ. They produce small whitish, purplish, or greenish flowers in axillary cymes. As they mostly bear clipping well, they are useful plants for fences or edgings.

Eupatoria, seaport on west coast of Crimea, Russia; 42 m. n.w. of Sebastopol by sea. Under the khans of the Crimea it was a flourishing place, and enjoyed a large trade in wool and leather. The mosques, walls, and bazaars are among the finest relics of the old Tartar civilization of the Crimea; in particular the mosque of Juma-Jami, built in 1552; p. 30, 172.



Boneset (*Eupatorium perfoliatum*).

Eupatorium, a genus of composite plants, mostly natives of America. The most striking species is the Joe-Pye-weed (*E. purpureum*) of American marshes, which rears its massive,

faded-purple head fully 10 ft. above the ground at times. The famous 'boneset' (*E. perfoliatum*) attains to five feet. A more delicate species, with looser heads of pure white flowers, is the white snake root (*E. ageratoides*).

Eupatridæ was the name given at ancient Athens to the landed nobility of the country. who, after the abolition of the ancient monarchy, were the ruling class in Attica until the time of the reforms of Draco in 621 B.C. The reforms of Solon in 594 B.C. entirely destroyed their political position.

Euphemism, the employment of a mild or delicate expression to signify something which it is considered unwise or indelicate to name more directly.

Euphonium, a modern brass wind instrument of large form, belonging to the saxhorn family.

Euphorbia, a large genus of plants of very wide distribution, mostly occurring in deserts or dry, sandy land. The poinsettia, common in florists' windows, possessing gorgeous scarlet upper leaves 6 inches long, is also a tropical spurge (*E. pulcherrima*).

Euphorbium, or **Euphorbion**, a term sometimes applied to the juice of several species of the Euphorbiaceæ, improperly called a gum-resin. Except in minute doses, this is a violent irritant to the respiratory and alimentary tracts.

Euphorbus, son of Panthous, was one of the bravest of the Trojans; Menelaus slew him.

Euphranor, ancient Greek sculptor and painter from about 360 to 335 B.C. His most famous work was a Paris, of which the seated *Paris* in the Museo Pio-Clementino at Rome is a copy.

Euphrates, called in the Old Testament Phrat, and now El Frat, is the most important river in Asiatic Turkey. It rises in two branches in the mountains of Armenia. Of little practical utility, the Euphrates is navigable for ocean-going steamers to a point only fifty miles above its confluence with the Tigris. The decay of the ancient irrigation works, which once made the Euphrates valley a vast expanse of fertile country, together with the bursting (1834) of the neglected embankments, and the consequent spreading out of the river into wide pestilential marshes, has destroyed both the source of its once great trade and the navigable value of the stream. Its length is probably 1,600 m., and the area of its basin 260,000 sq. m. The Euphrates was the farthest limit of the land of Israel to the east.

Euphuism, a term used to describe the extremely florid style employed by many of the

Elizabethan prose writers. The name is derived from *Euphuus*, a novel published in 1579 by John Lyly. It is satirized in Scott's *Monastery*. See LILY, JOHN.

Eupolis (c. 446-411 B.C.), one of the chief Athenian poets of the so-called Old Comedy. He was a contemporary and rival of Aristophanes, whom he more than once defeated. None of his works survive, but many fragments are extant.

Eurasian, an adjective compounded of European and Asian, used sometimes to denote the whole continent of Asia and Europe, 'the Eurasian continent,' but chiefly applied substantively to the mixed race that has arisen in Asia from the union between Europeans and natives. Officially, in India these people are now termed Anglo-Indians.

Eure, department of Northwest France, in Normandy. Its area is 2,330 sq. m. and its largest dimension is 70 m. from east to west. Cattle, sheep, and horses of the pure Norman breed, for which the department is famed, are reared in considerable numbers. Manufactures of textiles are carried on throughout the department. Evreux is the capital; p. 303,159.

Eure, river, France, a tributary of the Seine, rising in the department of Orne.

Eure-et-Loir, department of Northwest France, covering an area of 2,293 sq. m., and formed out of parts of Orleanais, Normandy, and Ile-de-France. The department is regarded as the granary of the Seine. Chartres is the capital; p. 255,213.

Euripides (485 or 480-406 B.C.), Athenian tragic poet, was born in 480 B.C., though the Parian marble gives the year of his birth as 485. He was a friend of Anaxagoras, and later of Socrates. His last years were spent at the court of Archelaus, king of Macedonia, where he died—it is said from wounds received from dogs maliciously set on him. Only seventeen of his plays are now extant, excluding the *Rhesus* (probably a later composition); but the titles of sixty-eight in all are known.

Euripides differed from his predecessors in being a more learned poet. He was abreast of the scientific and philosophic thought of his age, and loved to expound his views in his plays; these views often approached to a religious scepticism hateful to conservatives like Aristophanes. He was also a realist, using in his dialogue the language of the day, and making his characters resemble those of real life. It is clear that he was not popular in his own day, as he won the first prize in the tragic contests only four times; but in the fourth century and afterward his popularity equalled

or surpassed that of his rivals. It is perhaps as a master of pathos that he is supreme. His best plays are the *Hippolytus*, *Medea*, *Alcestis*, *Ion*, *Bacchæ*, and *Iphigenia in Aulis*. The last two were brought out after his death, and were probably his latest works. The *Alcestis* was produced in 438 B.C., and the rest of the extant tragedies between that date and 406; and it is impossible to trace in them any development of his genius. His skill as a playwright is of the highest order; he can construct plots which are exciting beyond anything attempted by his predecessors, and he has an unerring instinct for a 'situation.' His plays were 'revived' on the stage more frequently than those of Æschylus or Sophocles. Milton, Browning, Schiller and Alfieri, were ardent admirers of the work of Euripides.

Consult Mahaffy's *Euripides*; Symonds' *Greek Poets*; Verrall's *Euripides the Rationalist* (new ed. 1911), and *Essays on Four Plays of Euripides* (new ed. 1911); Norwood's *Riddle of the Bacchæ*. The best edition of the text is Nauck's; the best translation in English are by Gilbert Murray.

Eurite, an acid, igneous rock of the granite group, consisting of quartz and feldspar, with muscovite or garnet as accessory minerals, and mostly found as dykes and veins traversing granite and crystalline schists. The term is of French origin, and is sometimes used as a synonym for *granulite* and *felsite*.

Euroclydon, the name applied in the Acts of the Apostles to the cold, tempestuous wind that wrecked St. Paul. It is probably the *bora* that is referred to.

Europa, in ancient Greek mythology, daughter of the Phœnician king Agenor, or, according to Homer, of Phœnix. Zeus was charmed by her beauty, and in the form of a bull mingled with the cattle while Europa and her maidens were playing on the shore. His tameness enticed Europa to mount on his back, when he swam away with her to Crete.

Europa Point, the extreme point of the cape upon which Gibraltar stands.

Europe, the smallest but one of the great continents. The boundaries of Europe and Asia are not defined as clearly as those between the other continents. The Ural Mountains, Ural River, and the crest of the Caucasus may be adopted. (See article CONTINENT.) Within these boundaries, and reckoning Novaya Zemlya and Spitzbergen as well as Iceland with Europe, the total area is about 3,820,000 sq. m. The rough coastal length, neglecting minor indentations, is about 20,000 m., or three and a half times the minimum possible

periphery. The mean elevation of Europe is 1,080 ft. More than half the surface lies less than 600 ft. above the sea, so that the proportion of lowland is greater than in any other continent.

Europe consists of three well-marked divisions. (1) In the east are flat or gently undulating lands, rising nowhere over 1,160 ft., except in the Urals. The area of this division is half that of the Continent. (2) In the south are the lofty mountain chains whose highest points are in the Alps (15,780 ft.) and Caucasus (18,530 ft.). They extend from the Sierra Nevada of Spain to the Caucasus, bending round great flat plains or deep seas. (3) In the center and northwest are two highland groups, the former rising to 5,250 ft., the latter to 8,400 ft., separated by a band of lowlands and shallow seas.

Europe is well favored climatically. From its situation in the n.e. of the Atlantic Ocean, and n.w. of the Old World, it receives warm winds from a sea which is abnormally warm in winter, owing to the currents which drift before the w. winds. This mild climate permits the use of all the w. seas and gulfs, except the Baltic, all the year round; and these inward extensions of the ocean aid in assuring a mild climate to the w. half of the Continent.

Five floral belts may be distinguished:

(1.) The Tundra, coinciding with the cold n. climatic belt, producing no cereals and only stunted shrubs, Arctic flowering plants, and many mosses and lichens, of which the reindeer moss is the most valuable. It extends south along the Scandinavian plateau.

(2.) The Temperate Forest Belt occupies all the western and the northern part of the east climatic regions, its southern limit in the latter coinciding with that of morainic deposits. Coniferous forests prevail north of 60° n. in the west and north of a line from Lake Onega to the south of the Urals; but in the east, while pine, spruce, and larch prevail, birch and willow represent the deciduous trees. The land stretching south to the southern mountains is characterized by mixed woods. Deciduous trees—oak, ash, beech, elm, chestnut, lime, maple, sycamore, plane, and poplar—are characteristic trees of the lowlands; while pine, spruce, larch, and other conifers, birch, and rowan grow on the hillsides. Much of this land has been cleared for agriculture, except in the more hilly regions.

(3.) The Steppes lie in the southeastern region of scanty summer rains, where the rich black earth forms the soil. Parts of the steppes have been broken by the plough, and grow



CROSSING THE SEAS

large quantities of wheat and some maize.

(4.) The Mediterranean Vegetation Region coincides with the climatic one. It is characterized by evergreen plants with leaves whose cuticle or epidermis resists evaporation, or by bulbous and other water-storing plants which can endure the droughts of summer. The economic plants now characteristic of the Mediterranean area were introduced in early times mainly from Asia—olive, orange, lemon, vine, fig, almond, chestnut, mulberry, laurel, myrtle, cypress, and probably also the cereals and the deep rooted lucern. More recently the American aloe (*Agave americana*) and maize from America, and eucalyptus from Australia, have spread over this region.

(5.) The high mountains have a flora approximating to that of the tundra in its general characteristics of dwarf stature and leaves and of bright-colored flowers.

Europe lies entirely within the Palearctic animal area. Wild mammals, however, are comparatively rare, except in the northern forests or in the mountains. In these forests the brown bear, fox, lynx, otter, and ermine are found. The chamois lives in Alpine fastnesses. Stags as well as many game birds, such as the grouse, pheasant, and partridge are preserved by the hunting classes. The chief mammals are the domesticated horse, mule, donkey, cattle, sheep, goat, pig, dog, and cat. Silkworms are reared, and fish are propagated.

The population of Europe is a little less than 500,000,000, which gives a mean density of 129 per square mile. The density, however, varies greatly. Vast areas of the tundra and loftier and more barren mountains and highlands are uninhabited, while in the industrial regions the density is about 1,000 per square mile—for instance, in South Lancashire, or in Belgium. The majority of Europeans belong to the white race. Those in the north and south possess long, narrow skulls; but the southerner can be distinguished from the northerner by his darker color and shorter stature. A wedge of round-headed people stretches through the central uplands to the eastern plains.

The people of the tundra obtain a precarious living by hunting and fishing. The water-power of the Scandinavian mountains is utilized for preparing the timber, and for such manufactures as match making and wood-pulp for paper making.

The agricultural riches of Europe are very great. The cleared land of the forest area is cultivated at low levels. Barley is the most important crop in the extreme north, in the

clearings of the forest region, and it becomes extremely important again in the south, in Alpine lands. Oats, wheat, maize and rice are also grown.

Pulses are widely grown. Potatoes are cultivated, especially in the poorer lands of Ireland, Scandinavia, and the German plain. The sugar-beet is important between 40° and 58° on the Continent, and even farther south in the Danube lands. Flax is raised in North Russia, more particularly near the Baltic, on the Rhine delta, in Northeast Ireland, and in many parts of Austria. Hemp is cultivated in France, Italy, Austria, and South Russia. Tobacco is grown in many localities south of 55°. The olive, vine, fig, chestnut, and orange are the chief fruits of the Mediterranean region. The vine is also found in favored spots, such as the east of France, the Rhine valley, and most of Hungary. Pastoral lands are plentiful in the west, in all mountainous regions, and north of 55°.

Gold is mined in the Urals and in Hungary and silver in the Urals, in the Erzgebirge of Saxony and Bohemia, and in Hungary. Mercury comes from the Sierra Morena (Spain), and platinum from the Urals. Copper is obtained from the Sierra Morena, the Harz and Lower Rhine mountains of Germany, and in small quantities from the Urals, Norway, and the Ligurian Apennines. Zinc is important in Belgium and the adjoining parts of Prussia and the Netherlands, in Upper Silesia, the British Isles, France, and Spain. Spain and Germany are by far the most important European producers of lead, and are followed by Great Britain. The chief coal fields of Europe are the English, Scottish, Welsh, French-Belgian, Westphalian, Rhenish-Prussian, Saxon, Silesian, Bohemian, Polish—all except the Scottish lying in the Armorican-Variscan area—and those of the Oka and Donets in Russia. Iron is found in most of these regions, and great deposits exist in the Sierra Morena and Cantabrian Mountains, around the central plateau of France, in the Scandinavian peninsula, and in Finland.

Where coal and iron occur together, and transportation facilities exist, great industries have sprung up. The chief industrial regions are the north of England, the lowlands of England, the Scottish lowlands, the northeast of France, Belgium, the Lower Rhine region, Westphalia, Saxony, Silesia, Bohemia, Poland, and the Donets and Oka coal fields.

Few political boundaries are strictly natural, none of them is racial, and few are linguistic, the British Isles excepted. The Scandinavian.

Italian, and Iberian peninsulas form three well-marked natural regions. While the boundary between France and Spain is a natural one, that between Spain and Portugal is not. The boundary between Norway and Sweden is less artificial than the frontier between these countries and Russia, which is arbitrary. France has practically natural boundaries with Spain, Italy, Switzerland, and Germany, but the northeast frontier between it and Belgium follows no natural line. The frontiers of Belgium and the Netherlands are artificial. The frontier of Germany partly follows the crest of the Vosges, the Upper Rhine, the crest of the North Limestone Alps, and since Austria and the greater part of Czechoslovakia have been taken in, Germany's eastern frontiers are largely artificial. Switzerland is a mountain node, where a love of independence has induced peoples of different races, languages, and religions to combine to form a federal republic. Hungary has more or less natural boundaries. The other boundaries are purely artificial. The Balkan Peninsula is as diversified in its political as in its physical characteristics. The Danube separates Roumania from Bulgaria and from Yugoslavia; the Balkan Mountains divide Bulgaria proper from Yugoslavia. Greece lies at the southern extremity of the peninsula.

There are five small independent states—the grand duchy of Luxemburg; the principality of Liechtenstein, in the Eastern Alps; the principality of Monaco in the West Riviera; the tiny republic of Andorra, in the Pyrenees; and that of San Marino, in the Apennines.

Russia is a Soviet Republic. Germany and Spain are totalitarian. Hungary is a kingdom under a regent having no king. Portugal, Latvia, Esthonia, Lithuania, and Finland are republics; the British Isles are a strictly parliamentary monarchy; Belgium, the Netherlands, Denmark, Norway, Sweden, Yugoslavia, Roumania, Greece, and Bulgaria are limited monarchies; Italy, a monarchy to which a Fascist dictatorship has been attached. France is a bureaucratic republic; and Switzerland a federal republic of the most democratic type.

The Greeks and the majority of the Slavs belong to the Greek Orthodox Church; the rest of the Slavs, half the Celts, and the majority of the peoples speaking Romance languages, to the Roman Catholic Church; the rest of the Celts and most of the Teutonic peoples to various Protestant churches.

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Europe (Stanford's 'Compendium of Geography,' 2 vols., 1899, 1902); Partsch's *Central Europe* (1903). For Geology and Geomorphology—J. Geikie's *Prehistoric Europe* (1880); also geological survey reports issued by the governments of Germany, Great Britain, France, and Russia. For Climatology—Bartholomew, Buchan, and Herbertson's *Atlas of Meteorology* (1899), wherein an extensive bibliography will be found. For Fauna—Scharff's *History of the European Fauna* (1899). For Anthropology—Deniker's *Races of Men* (1900); Munro's *Lake Dwellings of Europe* (1890); Ripley's *Races of Europe* (1899); Keane's *Man Past and Present* (1900); and *A Selected Bibliography of the Anthropology and Ethnology of Europe* (Boston, 1899). For Historical Geography—Freeman's *Historical Geography of Europe* (3d ed. 1903); Hertslet's *The Map of Europe by Treaty* (4 vols., 1875-91). For Social Geography—Black's *L'Europe politique et sociale* (2d ed. 1892).

The history of Europe is in the main the history of the Indo-European or Aryan settlers on the Continent. We know little of their actual migration, but their starting-point seems to have been in Asia. Only four times has the ascendancy of the Aryan race in Europe been at all seriously threatened. In the 3d century B.C. the Romans fought an all-important war against the Carthaginians, who were of Semitic origin. In the 5th century A.D., Attila, at the head of a vast Ural-Altaic horde, was checked by a great Aryan victory at Châlons (451). In the 8th century the conquering Moors were stopped by the victory of the Frankish leader, Charles Martel, at Tours (732). Finally, in the 15th century, when Europe was in the throes of a great transition, the Ottoman Turks captured Constantinople (1453), which had long been the bulwark of the Eastern Aryans, and threatened to advance up the Danube valley into the heart of Europe. This danger, however, was in the end averted.

It is not till the 5th and 6th centuries B.C. that Europe begins to have a separate history of its own. The center of early civilization was the E. Mediterranean. The Persians, pressing like all early conquerors towards the Mediterranean, found it necessary to conquer the Greek settlements on the coast of Asia Minor. The assistance which these Ionian Greeks received from the opposite peninsula, and especially from Athens, provoked the Persian rulers to attack the Greeks in Europe. The invaders were foiled in the famous battles of Marathon, Salamis, and Plataea (B.C. 479). Athens, which had done more than any other

state to resist the Persians, and whose people took the lead in the advance of literature and art, was rewarded with the headship of the confederacy of Delos, which seemed a momentous stride towards unity of action among the Greeks. But her ascendancy was overthrown by Sparta in the Peloponnesian War (B.C. 431-404). Spartan domination, more brutal and more intolerable than that of Athens, was broken by the military successes of the Theban leader Epaminondas (B.C. 371-362). These divisions resulted in the enslavement of Greece to a neighboring and only semi-Greek state, Macedonia. Master of the forces of Greece as no native Greek had ever been, Alexander of Macedonia set out to conquer the Persians, and to make himself ruler of the known world. In a marvellous series of campaigns (B.C. 334-323), he carried the renown of Greek arms, and the more lasting influence of Greek civilization, over Egypt, the whole of S.W. and W. Asia, and even the northern provinces of India.

Pyrrhus, king of Epirus, was tempted to aid the Greeks by the prospect of forming an empire in the w. which might rival that of Alexander in the e. But his intervention (B.C. 280-275) proved unsuccessful, and Rome became mistress of the whole of Italy as far as the n. ridge of the Apennines. The first Punic War (B.C. 264-241) made Rome a naval power—a necessary condition of extensive rule—and also gave her her first dependent province in the island of Sicily. In the second Punic War (B.C. 218-202) Hannibal carried the war into Italy, and threatened the very foundations of Roman power. But in the end, in spite of his brilliant generalship, Hannibal failed. The war left Rome without a rival in the west, while it had also served to bring her into collision with Macedonia, which was still the dominant power of Greece. It is needless to trace the steps by which Rome was led from one annexation to another, until the whole of the Mediterranean coasts, including Greece, Syria, Egypt, and North Africa, were brought under her rule. Under the double difficulty of bitter class jealousies, which gave rise to civil wars, and of provincial discontent, the republican government broke down, and absolute authority was within the grasp of a successful soldier who could conciliate the support both of the army and of the mob. The founders of the empire were Julius Cæsar and his nephew Augustus.

A great disaster in A.D. 9, when three legions were cut to pieces by the German leader Arminius, induced Augustus to adopt a defensive instead of an aggressive policy, and to be-

queath this counsel to his successors. The only notable exception was the establishment, in the reign of Claudius, of a Roman province in Britain, which was ultimately extended to the Clyde and the Forth. There can be no doubt that the condition of the provinces was enormously improved by the substitution of imperial for republican rule.

Gaul and Spain became as thoroughly Roman as Rome herself. They adopted the language, the habits, and the whole culture of their conquerors. But in the e. Rome found already established the superior civilization of Greece; and the Greeks, though politically subjugated, were intellectually victorious. Constantine, who became sole emperor in 323, transferred his residence from Rome to the Greek city of Byzantium, which received from him its more familiar name of Constantinople. Another change of vital importance was due to Constantine, who abandoned paganism for Christianity, which henceforth tended to become the official religion of the empire. In the hope of strengthening Roman power in the west, a second emperor was set up in Rome, thus tacitly recognizing that severance between East and West which had been the one defect in Roman unity even when it was most complete. In 451 Attila led the Huns, one of the Asiatic tribes, to attack both Germans and Romans in West Europe. He was forced to evacuate Gaul after the battle of Chalons, and though he invaded Italy in the following year, he abstained from assaulting Rome, and his death soon afterwards put an end to all danger from the Huns. Already, in 470, Alaric the Visigoth had taken and sacked Rome, and in 476 the nominal emperor of the West was deposed by the German conquerors, who were now the undisputed masters of West Europe.

The final distribution of the German settlers upon Roman soil is perhaps more important than the history of their migration. The Vandals, one of the earliest and most destructive of the invading peoples, ultimately crossed into Africa, and made Carthage the center of their power. The Visigoths, who at one time held Italy and Rome itself, left the peninsula to establish themselves in South Gaul and Spain. The Burgundians settled in East Gaul along the Upper Rhine and the valley of the Rhone. The Ostrogoths occupied Italy; Britain was divided among the Jutes, Angles, and Saxons; while the Franks, who, though late in coming, proved in the end the most prominent of all the Teutonic peoples, conquered North Gaul and the greater part of West Germany. From one point of view, these Teutonic conquests

seemed to break the Roman empire to pieces, but the conquerors themselves never thought so. In every Roman province except Britain the invaders adopted the language, the religion, and in large measure the laws and institutions of the conquered inhabitants. This conception of the empire as still existing and in spite of its actual disruption is all-important for a clear understanding of the middle ages. During the reign of Justinian (527-565), the famous codifier of the Roman law, the authority of the emperor was once more restored in Africa and in Italy, though in the latter province it was before long shaken off again by the irruption of the Lombards.

In 800, the most powerful ruler in the West, the Frankish king Charles the Great, received the imperial crown from the hands of Pope Leo III. For a time the dignity remained in the hands of Charles's descendants, but after the disruption of the Carolingian dominion it was ultimately united with the German kingship by the coronation of Otto the Great in 962. Thus the division between East and West, so long a fundamental fact in European history, was rendered permanent by both a secular and an ecclesiastical schism.

Before this lasting separation of Eastern and Western Christendom had been completed by the coronation of Charles the Great, an event of immense importance both to the empire and the world had occurred in the East in the rise of Mohammed (570-632) and his militant church. From Africa the Mohammedans poured into Spain and Gaul, but their victorious career was checked at the battle of Tours (732); and though traces of their destructive activity may be found all along the north coasts of the Mediterranean, their political domination in Europe, until the later incursions of the Ottoman Turks, was limited to the Spanish peninsula.

From the 9th to the 13th century Western Europe continued to be dominated by the Roman tradition of unity, represented by the dual headship of Pope and Emperor. The chief practical illustration of the unity of Latin Christendom was supplied by the crusades. The dominions of Charles the Great had been divided among his descendants, and out of the confusing struggles and permutations there emerged two fairly coherent kingdoms, known at first as Western and Eastern Francia, but ultimately as France and Germany. The Christian peoples of Spain gradually took the aggressive against their Mohammedan conquerors, and, as the result of a long warfare, formed a number of separate states—Navarre,

Aragon, Leon, Castile (Leon was absorbed by Castile in 1230) and Portugal. In the north the Teutonic settlers in Britain, after prolonged struggles with one another, were formed into a single kingdom, England, under the headship of Wessex; and the unity of this kingdom was increased by two foreign conquests—the first by a Danish king, Cnut, the second by a duke of Normandy, William the Conqueror. The Scandinavians, another branch of the Teutonic race, after playing a great part as settlers and conquerors in Britain, in Normandy, and even in such distant regions as Naples and Sicily, gradually abandoned the aggressions to which their piratical and maritime habits had impelled them, and settled down to form three fairly well-defined states in Denmark, Norway, and Sweden. Two great families, the Welf dukes of Saxony and the Ascanian Margraves of Brandenburg, took the lead in asserting German ascendancy along the Baltic coasts. Commercial interests were involved in the enterprise, which was carried on by the great association of German towns known as the Hanseatic League. Finally, one of the crusading orders the Teutonic Knights, having lost its occupation in Palestine, found a new scope for its energies among the heathen Wends, and extended both Christianity and German domination over the vast plains of Prussia.

The 14th and 15th centuries witnessed the great transition from the middle ages to modern times. The claims of the emperors had already ceased to be more than shadowy pretensions. Even within Germany the authority of the emperors never recovered from the shock given to it by the Great Interregnum (1254-73), when two foreign princes claimed the title without attempting to exercise any of the functions of the office. The more firmly grounded power of the papacy did not long survive the decline of its rival. Residence in Avignon for nearly seventy years (1309-77) degraded the popes almost to the level of French bishops. No sooner had the papal residence been restored to Rome than the Great Schism (1378-1418) gave rise to what seemed at the time an almost irresistible demand for ecclesiastical reform. France, forced by the Hundred Years' War into unity with England, received administrative order under a powerful monarchy from Charles VII. and Louis XI. In England the anarchy of the Wars of the Roses worked its own cure by leading to the annihilation of the old nobles and the concentration of political power in the hands of the Tudor dynasty. In the Spanish peninsula the triumph of the Christians was completed by the conquest of Gra-

nada (1492), and in the same generation the foundation of a powerful Spanish kingdom was laid by the dynastic union of Castile and Aragon (1479), and by the annexation in 1512-15 of the greater part of Navarre.

The Reformation of the 16th century harmonized with the political conditions of the age. So far as Protestantism prevailed, it prevailed by its alliance with national forces and aspirations. The Hussite War, in which German armies suffered such humiliating disasters (1420-31), was no mere religious struggle: it was more important as a revolt of the Slavs of Bohemia against German domination. The fall of Constantinople (1453) removed the great barrier which had long impeded the advance of the Ottoman Turks, and Greece and the Balkan provinces fell into their hands. The possession of the Levant by the Mohammedan conquerors, completed by the seizure of Egypt in 1517, closed the old trade-routes between Europe and the East, and impelled the Spaniards and Portuguese to undertake those famous voyages which resulted in the discovery of a way to India round the Cape and of the American continent. Meanwhile the Turks continued the repulse of Sultan Suleiman from Vienna in 1529, marking the limit of Ottoman advance towards the west.

The final emergence in the 16th century of the great European nations resulted in the rise of a regular system of diplomacy and of orderly international relations. In the 16th century an extraordinary series of fortunate marriages and consequent inheritances gave to a Hapsburg prince, the Emperor Charles v., an agglomeration of territories in Spain, Italy, the Netherlands, Germany, and the New World, which made him more powerful than any Western ruler had been since Charles the Great. On his abdication in 1555, the German provinces with the imperial dignity passed to a separate branch of the Hapsburg family; but his son, Philip II., who received Spain with its colonies, the Italian provinces, and the Low Countries, seemed to be quite as formidable as his father when, in 1580, he acquired Portugal and the vast mercantile and colonial power which Portuguese enterprise had built up. A revolt in the Netherlands led to the establishment of an independent Dutch republic, which rapidly became a formidable military and naval power. Elizabeth disarmed her domestic opponents by the execution of Mary Queen of Scots, while English seamen not only repulsed the Spanish Armada, but struck in distant seas at the vital sources of Spanish strength. Finally, the accession of the Bourbon dynasty

in France put an end to civil strife: and under the guidance of a great king, Henry IV., and a greater minister, Cardinal Richelieu, France broke through the barriers with which the Hapsburg power had sought to shut her in on every side. Portugal, encouraged and aided by France, recovered her independence (1640-68), and by the treaty of the Pyrenees (1659) Spain was reduced to the rank of a second-rate power.

Richelieu and Mazarin bequeathed to Louis XIV. a power in Europe which he sought to erect into supremacy. Fortunately for Europe the revolution of 1688-9, provoked by the religious attitude of James II., transferred the English crown to William III., who was already recognized as the leader of European resistance to French aggression.

In 1700 the Spanish succession became vacant, and was secured by a grandson of Louis XIV., Philip V. The Grand Alliance, with England, Holland, and Austria as its chief members, was formed to oppose such a vast aggrandizement of the house of Bourbon. A series of brilliant victories on the part of the allies broke the power of France. Philip V. was allowed to keep Spain and the colonies, but the outlying Spanish dominions in Europe were mostly transferred to the Austrian Hapsburgs, and the strengthening of England, now united with Scotland, combined with the exhaustion and semi-bankruptcy of France, marked the failure of the ambitious schemes of Louis XIV.

The Treaties of Utrecht (1713) and Rastadt (1714), which closed the War of the Spanish Succession, seemed to establish that desired equilibrium in Europe which had been twice endangered, first by Spain and then by France. Yet from 1714 to 1789 the European states were always either at war or on the verge of war with one another. This was due to three great disturbing forces—the rivalry of France and Great Britain for maritime and colonial ascendancy; the rise to sudden pre-eminence of a new power, Russia; the desire of Frederick the Great to remedy Prussia's geographical weakness.

The colonial duel was rendered inevitable by the decline of earlier rivals in the field—Portugal, Spain, and Holland—and it ended in the discomfiture of France. Great Britain was able, in the Seven Years' War (1756-63), to deprive the French of Canada and Louisiana, to weaken both French and Spanish power in the West Indies, and to wrest all political and military authority from the East India Company of France.

The rise of Russia is the greatest event of the period, from an international point of view. While Southern Europe had been absorbed for two centuries in resisting first Hapsburg and then Bourbon ascendancy, the northern states had a separate thread of history. This was woven round the struggle for supremacy in the Baltic (*dominium maris Baltici*), which had been left vacant by the decline of the Hanseatic League. Charles' invasion of Russia and the defeat of Poltava (1709) ruined the power of Sweden, as a similar enterprise a century later ruined the power of Napoleon. Peter the Great seized the Swedish provinces to the east of the Baltic, built there a new capital, St. Petersburg, and set himself to introduce Western civilization into Russia. From this time Russia became more and more prominent in the politics of Europe, until under Catherine I. (1762-96) she swept away the intermediate Slav state of Poland and reached southward to the Black Sea.

The state of Prussia was built up under the house of Hohenzollern by the union of the old marks or border provinces of Brandenburg, wrested in bygone ages from the Slavs, with Eastern Prussia, the remnant of the once extensive dominions of the Teutonic Order, and with a portion of the inheritance of the dukes of Cleve. Thus the imperative necessity of strengthening a kingdom which had no natural unity explains, if it does not excuse, Frederick the Great's seizure of Silesia, and also his unscrupulous conduct in the first partition of Poland (1772), which gave him the invaluable province of Western Prussia.

The French Revolution marks a great epoch in the history of Europe. To the astonishment of the world, France, which was thought to be ruined, displayed under both republic and empire a military vigor even greater than that which had defied Europe in the time of Louis XIV. One coalition after another was crushed, and every Continental state, except Russia, suffered humiliation.

When in 1807 Russia agreed, by the Treaty of Tilsit, to become the accomplice of imperial France, Great Britain seemed to be the only hindrance to French domination in Europe. Napoleon had invaded Egypt and threatened India, but his Oriental schemes had been foiled by Nelson's victory at the Nile (1798). In 1804 he planned a direct invasion of English soil, but the enterprise had to be abandoned on account of the failure of Villeneuve to effect the desired naval concentration in the Channel, and the arming of Austria and Russia in the east. The battle of Trafalgar

(1805), by annihilating the naval forces at the disposal of France, left Napoleon no means of striking his enemy except by destroying her commerce.

By the Decrees of Berlin (1806) and Milan (1807) he deliberately set himself to close the markets of Europe to British trade. Napoleon discovered that in order to carry out his 'Continental system,' he must conquer Europe; that he must crush Portugal, Spain, and Russia as he had already crushed Italy and Germany. The Peninsular War, the disastrous march to Moscow, and the revolt of Germany in 1813, broke the power of imperial France, and after the brief scare of the 'Hundred Days' had ended at Waterloo, the successful allies reconstructed the map of Europe at the Congress of Vienna.

A successful revolt, encouraged by Russia and by Western sympathy, enabled Greece in 1829 to throw off the rule of the Turks, and to found an independent kingdom. Belgium, united with Holland in 1815 to form a kingdom of the Netherlands, rebelled against Dutch rule in 1830, and became a separate state under a king of its own. The Magyars of Hungary, succeeded in obtaining a constitution in 1867 which gave them, under the 'dual monarchy,' a substantial measure of self-government. Italy expelled the foreign rulers from its soil, and formed a united kingdom under the house of Savoy (1861). Nine years later, aided by German victories over France, Italy completed its external unity by extinguishing the temporal dominion of the popes, and by establishing its capital in Rome (1870).

In Germany, the national sentiment kindled by the long Napoleonic struggle had been woefully disappointed in 1815. At last Prussia, under the guidance of Bismarck, picked a quarrel with Austria about the duchies of Schleswig and Holstein; won a complete victory in the Seven Weeks' War (1866); and utilized its success to organize the North German Confederation in 1867. An opportune dispute with France, followed by a victorious march to Paris in 1870-71 (see FRANCO-GERMAN WAR), enabled Prussia to win over the South German states, and to found the German Empire.

European history since the Treaty of Vienna has been, to a great extent, supplied by the Eastern Question, which arose from the persistent efforts of Russia to reach the Mediterranean. Twice during the 19th century was the Russian advance in Southern Europe openly opposed—once by England and France in the Crimean War, in 1854-6, and again at

the Congress of Berlin, in 1878, when Russia had to moderate the terms imposed upon Turkey after a successful war.

The close of the 19th century found the chief Continental powers in two well-defined groups. On one side was the Triple Alliance (1883) of Germany, Austria, and Italy; on the other, the Dual Alliance (1895) of France and Russia. Great Britain, according to her traditional policy, held aloof from Continental obligations.

1900-1915—During the opening years of the new century, important factors in European history were the movement toward popular government, the religious unrest in the southern countries, and the new balance of power, and the disturbance of European interests in other continents.

The movement toward popular government is evidenced by the formation of a constitutional kingdom in Norway after its separation from Sweden (1905); the summoning of the Russian *duma* (1906); the victorious revolution of the constitutional party in Turkey (1908); the establishment of a republic in Portugal (1910); the granting of local autonomy to Alsace-Lorraine (1911); the curtailing of the power of the British House of Lords (1911); the revision of the Greek constitution, providing for the better working of liberal institutions (1911); and the passage of the Irish Home Rule Bill (see *HOME RULE*) in the British Parliament (1914).

In the south of Europe, a general agitation, largely political and economic, for the separation of church and state has resulted in disestablishment in France (1905) and in Portugal (1910). Spain developed a strong anti-clerical party; and the disestablishment of the Church of England, widely agitated, resulted in Welsh disestablishment in 1914. (See *DIS-ESTABLISHMENT*.)

New elements in the balance of power were the increased strength of Germany and Austria, and the union of England, France, and Russia in a Triple Entente. The Triple Alliance, which included Germany, Austria and Italy, was ruptured, when Italy, claiming that the bond was for defence only, refused to enter the Great War (see *EUROPE, GREAT WAR OF*) on the side of the Teutonic Allies, and in May, 1915, joined the Entente.

The encroachments of Christian Europe upon the Mohammedan world have been responsible for recent marked geographical changes in the maps of Europe and Africa, and seemed to indicate that the Ottoman Empire was reaching its end. The Greco-

Turkish War of 1897 (see *GREECE*) resulted in only slight frontier modifications; but in 1908, Crete announced its allegiance to Greece, Bulgaria declared her complete independence of the Porte, and Bosnia and Herzegovina were annexed by Austria-Hungary. Italy, fearing Germany's intrusion upon her claims, found a pretext and declared war on Turkey on Sept. 29, 1911. In the ensuing settlement (the Peace of Ouchy, 1912), Italy was awarded Libya (Tripolitana and Cyrenaica in Africa).

The Balkan Wars of 1912 and 1913 (see *BALKAN WAR*) ended in the partition of all European Turkey, except 11,000 sq. m., among Serbia, Bulgaria, and Greece; the creation of the independent state of Albania; and the establishment of Slavic supremacy in the Balkan Peninsula, under the protection of Russia. The threatened exercise of this protection was the immediate cause of the quarrel between Austria and Serbia in 1914 blazing into the general European War.

In Western Asia, Russia, after her recovery from her war with Japan (see *RUSSO-JAPANESE WAR*), began to resist Turkey's hand in Persia. Morocco continued to be a center of international interest. The Treaty of Algeciras (1906) and the Franco-German agreement of 1909 left the police power in Morocco to France and Spain. While the two countries disclaimed any intention of territorial acquisition, Germany adopted an aggressive policy, nominally for the protection of German citizens and property. This culminated in the Agadir Incident (see *MOROCCO*) of July, 1911, was settled by Germany's recognizing French supremacy in Morocco, and receiving as 'compensation' a large slice of the French Congo.

Japan, by her naval equipment and the prestige gained by her victories over China and Russia, was admitted to equality with the European Powers in the settlement of Eastern affairs. Japan and Russia came to an agreement concerning Manchuria in 1911; and in the same year Japan and England renewed, with modifications, their alliance of 1902.

In the West, also, international relations ceased to be wholly European. The United States, which in 1898 deprived Spain of the last remnants of her colonial power, had acquired considerable influence in European diplomacy even before her part in the Great War. See *UNITED STATES*.

The history of Europe from the middle of 1914 to 1918 is the history of the Great War, growing immediately out of the assassination on June 28, 1914, of the Archduke Francis

Ferdinand, heir presumptive to the thrones of Austria and Hungary, but having its real roots in lust for world conquest. For a record of this tremendous conflict, see EUROPE, GREAT WAR OF.

The Peace Conference assembled at Versailles, Jan. 18, 1919, was confronted by problems of vast significance for the future not only of Europe but of the world. The treaty having been completed, German delegates were summoned to Paris to receive the terms of peace. Their signatures were affixed to the historic document June 28, 1919. In the meantime Austrian delegates had received the Austrian treaty for their signatures. It was signed Sept. 10. (See PEACE CONFERENCE; LEAGUE OF NATIONS.)

European history after the Great War was marked by the disappearance of several monarchical governments and their replacement by democracies; the rise of new national states; the establishment of some dictatorships; the question of the reparations which Germany was to pay; the interallied debts; economic disturbances and conflicts between labor and capital; attempts to establish a permanent peace system through the medium of the League of Nations, the World Court, and reduction of armaments; and nationalistic revolutionary movements in Asia and Africa for the purpose of throwing off European domination.

The first monarchy to fall was that of the Romanovs of Russia. This took place even before the Great War closed. The Duma—the semi-representative body in Russia—on March 14, 1917, voted to abolish the monarchy and establish a provisional government. The real leader of this was Miliukov, a man of education, culture and liberal ideas. Under his guidance freedom of speech and religious equality were established, Poland and Finland granted autonomy and a constitutional convention called to frame a new government.

Before this convention could meet, a rival to the provisional government was set up in St. Petersburg by a congress, known in Russia as a Soviet, of delegates chosen by workingmen and soldiers. This body passed a series of resolutions demanding that Russia withdraw from participation in the War, calling upon the soldiers to desert and urging the peasants to seize the lands of their landlords and the workingmen to take over the factories. Soviets similar to that in Petrograd (St. Petersburg) were organized throughout the country. See BOLSHIEVISM; RUSSIA: History.

At first the Allies bitterly opposed the meth-

ods employed by the Bolsheviks and gave every encouragement to those Russians known as the Whites, under the leadership of Admiral Kolchak and General Wrangel, who were trying to overthrow the strangle hold which the communists, known as the Reds, had on Russia. As such attempts all failed, many of the nations of Europe and America gradually recognized the Soviet as the *de facto* government. The United States gave formal recognition on Nov. 17, 1933:

White Russia, Ukraine, Georgia, Armenia, and Azerbaijan, formerly parts of the Russian Empire, have set up Soviet states and joined themselves in a union with the Russian Soviet Republic under the title of Union of Soviet Republics, but other countries have not been led to follow the Soviet experiment.

In Germany the flight of the Kaiser in November 1918, virtually destroyed the Hohenzollern monarchy. A group of socialists headed by Ebert and Scheidemann set up a provisional government, proclaimed Germany a republic and called a national assembly elected by universal suffrage to meet in 1919. The latter elected Ebert provisional president and adopted a democratic constitution. Ebert died in 1925 and the people chose as president General von Hindenburg, who showed himself a loyal supporter of the republic and its ideals. See GERMANY for later history.

The Austro-Hungarian monarchy of the Hapsburgs also disappeared as a result of the War. Hungary and Bohemia were separated from Austria, and other portions were given over to Italy, Yugoslavia, Roumania and Poland. Austria, almost a shadow of its former self, was formed into a republic and the Emperor Charles I. fled. The tottering existence of the Austrian republic ended 1938, when it was taken over and merged into Hitler's Germany.

Hungary was also proclaimed a republic under the headship of Count Karolyi, but in March, 1919, he was overthrown by a group of radicals inspired by the Bolshevik ideals and headed by Bela Kun. A national assembly was chosen in 1920 which decided to make Hungary a kingdom with Horthy as Regent, but up to 1939 no king had been selected.

Turkey was badly dismembered by the Allies, but the Turks refused to submit to such divisions and the nationalists under the able leadership of Kemal repudiated the action of the Sultan, who was deposed and a republic proclaimed with the seat of government at Angora. In 1924 a national assembly

adopted a constitution which granted equal rights to all citizens. Polygamy was abolished, church and state separated and laws enacted modernizing Turkey. Kemal was elected president of the republic.

Greece after the Great War remained a kingdom, but having embarked on a war with Turkey in which she was badly defeated, the wrath of the people was aroused against King George II., and in 1924 the Greek Parliament deposed him and proclaimed Greece a republic. The kingdom was restored in 1935 and King George II returned to reign.

Poland, which, during the 18th century, had been partitioned between Russia, Austria and Prussia so that she ceased to exist as a nation, was reconstituted with nearly all of her old territory. A republican form of government similar to that of France was set up in 1921, General Pilsudsky, was chosen president and Paderewski, prime minister. In 1926 Pilsudsky disbanded the Parliament and for a time established a virtual dictatorship. For later history, see POLAND.

Bohemia and Moravia, which had been parts of the Austro-Hungarian Empire, and Slovakia, which had been a part of Hungary, were formed into a country under the name Czechoslovakia, with its capital at Prague. A constitution providing for a republican form of government based on universal suffrage was adopted in 1920, and Professor Mazaryk was chosen president. It showed stability and enjoyed prosperity until seized and subjugated by Germany, 1939. See CZECHOSLOVAKIA.

Along the Baltic, from the Gulf of Finland south, three other small countries, Estonia, Latvia and Lithuania, became independent of Russia and in 1918 each adopted a republican form of government. Finland, which had been a dependency of Russia with a constitution of its own, was made completely independent and a republican form of government was set up in the same year.

Certain provinces which had belonged to the Austro-Hungarian Empire such as Croatia, Slavonia, Bosnia and Herzegovina were combined with the kingdoms of Montenegro and Serbia and formed the Serb-Croat-Slovene State, Yugoslavia with Peter of Serbia as king, 1918-21. He was succeeded by Alexander I., who was assassinated in 1934. Its history has been somewhat stormy because of the conflict with Italy over the possession of the port of Fiume, which had been allotted to the new kingdom, but which Italy seized. In 1924 it was agreed between the two coun-

tries that Italy should have the port and the Serb, Croat, and Slovene State enjoys a certain freedom of its use. A new state was also formed in the British Empire, known as the Irish Free State. See IRELAND: *History*.

The uncertainties and confusion, which follow in the wake of every war, unsettled the regular methods of conducting government in some of the older as well as the newer states so that men at the head of affairs seized dictatorial powers and used them in violation of the formal constitution and laws. This was true in Russia, Poland, Turkey, and Greece.

In no country except Russia did greater turmoil and confusion arise than in Italy where strikes and socialistic agitation reduced the country to the verge of anarchy. At this juncture a former socialist named Mussolini, who had changed his opinions, organized the ex-soldiers and great numbers of the population into a body known as the Fascisti for the maintenance of law and order. See FASCISM; ITALY, *History*.

Though Spain had not suffered from the Great War in which she remained neutral, her Parliament, known as the Cortes, and her cabinet had become so honeycombed with corruption as to make decent government impossible. In 1931, King Alphonso XIII was deposed and a republic set up. Bitter class feeling and labor troubles, fed by Italian intrigue, led to civil war, 1936, resulting in victory, 1939, for the Italian and German supported Gen. Franco. See SPAIN, *History*.

Labor troubles were not confined to Italy and Spain. There were uprisings in Germany, Austria, Hungary, and many other states, particularly England. During the premiership of Lloyd George unemployment had become so prevalent owing to the closing of factories and mercantile establishments that a system of 'unemployment doles' was set up. This did not seem to improve matters and when in 1922 Lloyd George was defeated, his successor, Stanley Baldwin, leader of the Conservative party, tried to inaugurate the policy of a protective tariff for British industries. In the elections of 1923 Baldwin did not receive a majority and the Liberals, who were opposed to protection, combined with the Labor party to give majority support to the establishment of a labor ministry headed by J. Ramsay MacDonald. Dissatisfaction with his handling of the Russian question caused his defeat and by the elections of October, 1924, Baldwin was returned to office. In spite of a new tariff law, an extension of the old age pension system and the re-establishment of the gold

standard in 1925, labor troubles did not cease. Strikes were very general, the most serious being in the coal mines. See ENGLAND.

Since the close of the war the question of reparations had troubled Europe. Germany had been called upon to pay an amount equal to thirty-three billion dollars. When she failed to make payments in 1922, France occupied the Ruhr, the greatest industrial and coal district in Germany. This was far from solving the question so that in 1924 a group of Americans, headed by Charles G. Dawes, all experienced in banking and industrial operations, was asked to investigate the situation and make recommendations. The Dawes Plan, called for the stabilization of German currency, yearly payments of variable amounts depending on the state of business in Germany, and the subscription by the Allies to a loan. The plan and its later modifications failed and reparations continued to be uncollectable.

Another problem was that of the interallied debts. The Great War had made it necessary for governments to borrow such huge amounts that the ordinary methods of obtaining loans from their own and citizens of other countries would not suffice. Accordingly the governments most able to do so loaned to those who could not raise funds. Great Britain loaned large sums to her European Allies and the United States loaned to Great Britain as well as to the others. This meant that these borrowing nations instead of trying to float their own bonds among the citizens of the United States induced the government of that country to float loans among its people. In a real sense the government of the United States had only acted as an agent. Nevertheless there was considerable agitation to have the United States cancel these debts. This the United States government refused to do and appointed a Debt Funding Commission to negotiate for the repayment on as lenient terms as possible. See WAR DEBTS.

Much of the interest in Europe since the Great War has been in the League of Nations. (See LEAGUE OF NATIONS, also WORLD COURT.) Though not a member of the League the United States has always been interested in the reduction of armaments and a conference was called which met at Washington in November, 1921. Great Britain, United States, Japan, France and Italy all agreed to reduce armaments and maintain a specified ratio between certain kinds of vessels, not including submarines, airships and aeroplanes. Other articles of agreement affecting the integrity of

China were included. Though productive of good results, new conditions arose which prompted the request of the United States for a similar conference at Geneva, Switzerland, in July 1927. France and Italy declined to participate but Great Britain, Japan and the United States were represented. The latter proposed a lower tonnage of war vessels than Great Britain was willing to accept so that the conference was not successful.

In 1924 the League of Nations announced a Protocol extending the powers of the League in matters of arbitration to include even questions held to be of vital interest or national honor, and declaring an aggressor nation to be one which refused to submit a case to arbitration or rejected a decision when made. Great Britain refused to accept it as too sweeping and the Protocol then failed to become effective. In part its place was taken by a series of agreements made at Locarno, in 1925, by Great Britain, France, Germany, Italy and Belgium, by which Germany's western frontiers as fixed by the Treaty of Versailles were guaranteed, the river Rhine was not to be a fortified frontier, and France, Germany and Belgium agreed to arbitrate all disputes between them.

The influence of the nationalist movements in Europe which had grown out of the Great War soon began to have their effects in Asia and Africa where European countries dominated other races. In 1921 Persia asserted her independence and Great Britain abandoned the virtual protectorate which she had held over that country since 1907. Troubles in Egypt led Great Britain in 1922 to recognize that nation as an independent state subject only to Britain's control of her foreign policy, protection against foreign aggression and the ownership of the Suez Canal.

In India Great Britain was forced by nationalist agitations in 1919 to grant concessions in the matter of local self-government and the election of a popular national Assembly (see INDIA, *History*).

Since 1933 the European situation has been assuming new phases. Nationalism has become more pronounced. The League of Nations weakened by withdrawals, ceased completely to be an influence for peace. German, Italian and Japanese aggressions met with no effective challenge. Austria, Czechoslovakia and Albania were effaced, and Spain ravaged by civil war; Memel was torn from Lithuania and Poland attacked by Germany, causing the outbreak of World War II in 1939 which finally caused the League to liquidate.

By Sept. 1941 Germany had assumed control of Europe and was at war with Russia and Eng. For continuing events see **World War II Chronology**.

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Europe, Great War of (1914-19). If there are any fundamental ideas which have formed and guided the motives, national aims, and ambitions of the nations arrayed against one another in the latest and greatest European War, they may be said to be two opposing conceptions of the relation between the state and the citizen body that composes it. Are the people themselves the unit, and does the state exist to serve them and further their happiness and prosperity; or is the state the unit, to whose well-being and power the people must submit themselves? The first of these theories—that of modern democracy—was held by the comity of nations at war with the Teutonic coalition, whose very creed was the second view—that of modern autocracy.

On June 28, 1914, the Archduke Francis Ferdinand, heir-presumptive to the throne of the Dual Monarchy, and his wife, Sophie, duchess of Hohenberg, were assassinated in the streets of Sarajevo, the administrative capital of Bosnia. The crime was committed by an Austrian subject of Serbian sympathies, and would appear to have been a protest against the annexation of Bosnia and Herzegovina; but it contained some decided elements of mystery, which were made the more prominent by the attitude of the Court of Vienna toward the murdered pair.

Austria declared that the murder plot had originated in Belgrade; that it was organized, if not by the Serbian government, at least by secret societies which it tolerated and protected; and that measures must be taken to prevent similar outrages. On July 23 she sent an ultimatum to this effect to Belgrade, and gave Serbia forty-eight hours in which to reply. The assassination of the Archduke cannot be laid at Germany's door, all suspicions to the contrary. It served merely as an excellent pretext for a war which had already been planned for the summer to come.

On July 25, within the stipulated time, Serbia sent her reply, accepting the conditions as prescribed except the two that concerned the co-operation of Austrian officials. These were granted with certain reservations, or, as

an alternative, reference to The Hague tribunal was proposed. Thereupon Austria peremptorily announced that the reply was unsatisfactory; within a few minutes after its receipt broke off diplomatic relations with Serbia; and declared war on her neighbor on July 28.

Meanwhile, the rulers and diplomatists of Europe were straining themselves to the utmost over the alarming situation. Without going into the details of their correspondence between July 24 and 30, its essential points, in the order of their development, are as follows:

Germany contended that the question concerned Austria and Serbia alone, and that the former must have a free hand to settle it. Russia announced that she would not desert Serbia in her hour of danger. Germany asked England to use her influence at St. Petersburg in favor of non-intervention. England answered that she was not justified in doing so, but offered to join with France, Germany, and Italy in an endeavor to smooth matters between Russia and Austria; but Germany reiterated that she could not interfere. Germany repeated to France the request made to England, but France also refused to use her influence. M. Sazonov, the Russian Foreign Minister, pointed out to England that if she would declare that, in case of a general war, she would unite with France and Russia, and thus bring her great fleet into the conflict, Germany would be less arbitrary in her demands for Russian non-intervention. Though peace concerned her greatly, England stated to M. Sazonov that the Austro-Serbian quarrel did not affect her interests, and that she wished a free hand to act in the future. Russia offered to guarantee the result if Austria would withdraw her ultimatum, respect the sovereign rights of Serbia, and promise that she would not make of her an Austrian dependency. England proposed that the four Great Powers not affected by the quarrel (England, France, Germany, and Italy) should intervene as mediators. Germany accepted the principle of mediation, but refused a conference, on the ground that Austria and Russia should not appear before a court of arbitration. Meanwhile Germany warned the other Powers that if Russia came actively to the assistance of Serbia, a general war would result. This was on July 28, the day that Austria declared war. Russia announced a partial mobilization (July 29), but assured Germany that she had no aggressive intention toward her. Germany answered that if Russia did not stop at once,

her own army would receive mobilization orders; whereupon Russia ordered further mobilization. The Imperial German Chancellor informed the British Ambassador at Berlin that if Great Britain would stand aside in case of war, Germany, if victorious, would seek no territorial aggrandizement. The neutrality of Holland would be respected, but that of Belgium would depend upon the action of France (July 29). Great Britain still stood out for liberty of action. Austria declared a general mobilization, and Russia followed suit. Austria suddenly became conciliatory. She offered to accept mediation, and informed Germany of the fact (July 31).

Ultimatums to Russia and France were being despatched by Germany on that day. In her impatience she had taken matters into her own hands. It was Russian demobilization or war, and the former was actually ordered by the Czar. His command was ignored only because the Russian Minister of War, General Soukhomlinov, was not blind to the inevitable trend of events. The Austro-Serbian quarrel dwindled into insignificance, and the whole world thrilled to the spectacle of the two great empires facing each other in warlike attitudes. Germany, Janus-wise, was facing towards France as well. France must be crushed first for the safety of the kingdom; but the Russian Chief of Staff was proving too efficient.

Russia had France for an ally. Also she had had, since 1907, an understanding with Great Britain in case of trouble, and these countries composed the Triple Entente. Germany, Austria, and Italy were leagued together, but the Triple Alliance was for defence only—and that is why Italy had refused assistance to Austria's project of attacking Serbia, as announced in 1913, and that is why she kept aloof now, although she began at once to prepare for war.

In the first period, Germany had greatly the advantage, both in numbers of fighting men and supply of munitions. She threw into France and Belgium about 2,250,000 men. To oppose the unexpected Russian invasion of her eastern frontier, she placed 250,000, and increased this number to approximately 1,000,000 by Oct. 1. In addition she had 1,000,000 more available, who were chiefly used in occupying Belgium, and later in her attempts to break through Flanders to Calais and the English Channel. So it may be said that Germany's first efforts were made with about 4,500,000 men. Austria put somewhat over 1,000,000 men into the field at once, against Russia and Serbia. France had about

1,000,000 ready to receive the first shock, but she got another 500,000 into condition in very short time. Russia's first contribution was about 1,250,000, sent against Germany and Austria. This was a low figure, considering her enormous resources; but the equipping was slow, and the munition supply below that of the other nations. Great Britain, with no reserve and relying upon enlistment, managed to get 500,000 men prepared before the winter, and about 1,000,000 more were training in, or hurrying from, her colonies.

Before the middle of 1915, Russia had approximately 3,000,000 men in the field, a small increase in proportion to her allies and enemies. In 1916 she had mobilized not far under 10,000,000 men. Her losses in dead alone were close to 2,000,000. Her greatest handicap was shortage of munitions. From these figures we see that, at the beginning, Germany outnumbered her opponents on the Western front by two to one. On the Eastern front the sides were nearly equal. Beginning in 1917, with an army of 200,000, the United States had in the field in France close on to 2,000,000 men, and with many more in training in America.

The Invasion of Belgium.—The German plan was to make a sudden invasion of France in her comparatively weak condition, and reduce her to impotency; which event would leave Germany free to deal with Russia, who, it was believed, would be very slow in mobilizing. To gain time and be at the gates of Paris within two weeks, she planned to sweep unopposed into France through Belgium, and not across the strongly fortified border facing Alsace and Lorraine. This move gave a moral shock to the rest of the world, for Prussia, with the other Powers, had guaranteed to respect Belgian neutrality in a treaty made in 1839.

Upon the invasion of Belgium, Great Britain entered the war. The Belgians refused the requested permission to march through their country, and determined in all their small power to resist; and here is where the time factor began to fail. The grand-duchy of Luxemburg, also inviolate by the Treaty of London (1867), was occupied under protest by German troops on Aug. 2.

The entrance into Belgium was eventually made over four routes. The vanguard of the invaders took the route up the valley to Liège on Aug. 3, for the very first thing to be done was to capture the strong but ill-equipped ring of forts surrounding Liège, which would open the railway system into France. The striking force consisted of three divisions of General

von Kluck's army under General von Emmich, and the first shots were fired on the afternoon of Aug. 4. Liège was defended by a force of 20,000 under General Leman. Their resistance was stubborn but unavailing. The quick fall of Liège, one of the strongest places in the world, showed beyond dispute that a revolution had been worked in the art of warfare, and that massive permanent earthworks must go into the military scrap heap.

Aided by the railway, Von Kluck now moved as rapidly as possible toward his fellow generals, his cavalry acting as a screen, and sweeping Belgian garrisons and other small bodies of troops from the path. A triumphal entry was made into Brussels on Aug. 20, whence the government and the greater part of the active Belgian army had fled to Antwerp three days before. The attack on Namur began Aug. 20; by Aug. 23 the Germans were in possession. The sudden collapse of this stronghold was an unexpected blow to the Anglo-French resistance.

The Retreat from the Sambre.—This was a perilous moment for France. Three German armies were ready to begin the great drive upon Paris. Besides these, to the eastward the army of the Imperial Crown Prince had begun the siege of Longwy (Aug. 6), and a French force sent to the rescue was promptly driven back to Verdun and into the Argonne region. In Lorraine, the army of the Crown Prince of Bavaria was attempting to isolate the French right flank. Nancy was in great danger, but General De Castelnau was still able to hold back the approaching flood. Lunéville was occupied Aug. 22, and Mézières the following day. Longwy capitulated to the Imperial Crown Prince on Aug. 27.

The French strategical plan to oppose the invaders was one devised by the great Napoleon to meet a force attacking in superior numbers. Briefly, it consists in disposing units of defence approximately at the four corners of a square. Whichever corner receives the main shock of invasion begins a 'fighting retreat,' delaying the enemy's advance until the other corners can swing to its support. The 'corner' destined to experience the first important clash of the war in the West was in position by Aug. 22—from in front of Mons to Charleroi, thence behind the Sambre to Namur, and thence southward along the left bank of the Meuse.

Pursuant to the strategical plan, the two French armies began to retire from the Mons-Namur line on Aug. 23, and the British on the following day. On Aug. 27 the Anglo-

French got their first rest on the line Noyon-La Fère-Laon. Then the French, with reinforcements now arriving from the eastward, made a sharp attack at Guise, and succeeded in bending back the German line for a considerable distance. This advantage was not pursued, however, by General Joffre, the French commander-in-chief, who wisely decided to continue his strategy until the large force around Paris and in Eastern France could come into play. On Aug. 29 he and Sir John French again took up the retreat toward Paris, while the pursuing enemy, their enveloping movement sweeping westward as far as Amiens, crossed the Marne, and also occupied Rheims and Châlons. When, on Sept. 2, the retreat came to an end, the opponents faced each other on a line whose western extremity was perilously close to Paris, and thence continued in a deep bend through Vitry-le-François on to Verdun, now encircled by the Crown Prince's army, and southeast to the neighborhood of Nancy. (See MONS AND SAMBRE, RETREAT FROM.)

Battle of the Marne.—The military science of Joffre had saved Paris. The Allied commanders determined to assume the offensive, and did so on Sept. 6. Joffre, in the order of the day, told his soldiers that upon the battle now to begin depended the fate of their country.

The line was 200 miles long, from southwest of Soissons almost to the Swiss border, and was occupied by 3,000,000 men. On the west it stretched through the valley of the Marne, which has given its name to the battle. Von Kluck was still looking for a chance to get at Paris by his left. Duke Albrecht of Würtemberg drove savagely at the French center for four days before he was forced back. Meanwhile, a new French army of reserves (reinforced to 150,000) had been rushed in every available taxicab and motor-bus in Paris to the banks of the Ourcq, where, under the leadership of General Maunoury, they persistently attacked the German right until, on Sept. 10, joined by Sir John French, they made an overwhelming and successful assault upon Von Kluck. General Foch, who had been attacking the German center and right, thrust a wedge between them, and drove his opponents into the swamps of St. Gond. This bent the German center back. Rheims was retaken, except for three outlying forts, which were destined to do incalculable damage to the city and its monuments. By Sept. 11 the Germans were in retreat all along the line. The pressure upon Nancy was relieved, and

Sept. 12 marked the end of the Battle of the Marne. The Germans had retreated to a line of trenches they had prepared along the Aisne. (See MARNE, BATTLES OF.)

In Alsace-Lorraine.—Uncertain as to the direction whence the main strength of the German invasion would come, France sent a considerable force in the direction of Alsace and Lorraine. Finding the resistance slight, by Aug. 20 the Vosges region, including Mülhausen, was in French hands. Saarlburg was captured and rail connection between Metz and Strassburg cut off. Paris went wild with joy at the news but it was short lived. Four German corps came from the north and by Aug. 22 the entire region was cleared of the French.

Austria and Serbia: July 28-Aug. 23, 1914.—An Austrian army began to bombard Belgrade, the Serbian capital, the very day that war was declared (July 28), and the government removed to Nish. On Aug. 17 the first important battle was fought near Sabac, and resulted in a victory for the Serbians, who had retaken the town from the Austrians the day before. Austria hastened more troops from Bosnia, and the Crown Prince of Serbia attacked the reinforced enemy on the banks of the Jadar (Aug. 18). The battle raged four days, until the Austrians were completely defeated. By Aug. 23 they were out of Serbian territory.

Lemberg.—Austria lost no time in setting out for Russia; and two armies took the field. One, under General Dankl, the other, under General von Auffenberg. Dankl encountered an inferior force, which he pushed back and eastward toward the River Bug. At this juncture (Aug. 14) a Russian army under General Russky, appeared in Galicia squarely upon Von Auffenberg's front. The latter's retirement, fighting all the way, brought the Russians close to Lemberg by Aug. 21. The Austrian general soon found his line bent back into such a dangerous horseshoe that he could do nothing but take up a new line behind Lemberg, and leave that important city to the enemy, who entered on Sept. 3. Von Auffenberg's retreat became a rout. By Sept. 13, 130,000 Austrian prisoners were in the hands of the Russians, who advanced rapidly toward the Carpathians to besiege Przemysl and Jaroslau. The latter was captured on Sept. 23. Dankl, who found his flank completely uncovered, lost no time in getting out of Russian territory.

In East Prussia: Aug. 7-Sept. 15, 1914.—Germany had expected that Austria would hold Russia until she had finished with France,

but the Russians, proceeding with their mobilization with great haste, were able by Aug. 7 to send two armies, totalling 250,000, neither well trained nor equipped, into East Prussia. The eastern army, under General Rennenkampf, defeated the Germans in a four-day battle at Gumbinnen (Aug. 16-20). The southern army, coming by the Narew River, overwhelmed a single German corps at Frankenhau (Aug. 20). The Russians pressed westward. They took Allenstein, and by Aug. 25 were very close to the Vistula.

Samsonov, the Russian commander, had no knowledge of the existence of a force of nearly 200,000, drawn largely from troops still within Germany, splendidly equipped with heavy artillery, and under the command of a great general—Von Hindenburg—until it was upon him. He took the offensive at once (Aug. 26), but Von Hindenburg, in a great battle that lasted until Sept. 2, bent his line back until retreat was imperative. The retreat was broken in two (Aug. 31): the northern half managed to escape with considerable loss, but the southern half met with the extreme of disaster. This was the great victory of Tannenberg (see TANNENBURG, BATTLES OF), and by the middle of September all the Russians had been swept beyond the Prussian border.

First Battle of the Aisne: September-October, 1914.—The Battle of the Marne cost half a million men, and brought no decisive results. The Germans were thwarted in their attempts to reach Paris; the Allies failed to drive them out of France. The line of the Aisne, at which the Anglo-French drive came to a halt, was an excellent defensive position, where the Germans further protected themselves by trenches, entrenchments, barbed-wire entanglements, and shelters of all kinds, prepared according to the most approved methods of military science, and capable of standing a prolonged siege.

The Battle of the Aisne—in reality a whole campaign—is the name given to the succession of attacks on and by the German left and center, beginning with the hard-contested passage of that river by the Allies near Soissons on Sept. 13, and continuing until the second week in October. The Imperial Crown Prince retreated from Verdun, and there was hard fighting around Berry-au-Bac and Rheims, where the invaders lost ground, whereupon Rheims was bombarded (Sept. 19 *et seq.*) and its famous Cathedral partially destroyed.

But the more important actions were further west. Here the Allies tried to turn the German right and force a general retirement to the

Meuse; the Germans tried to pierce the French left and threaten Paris anew. General Joffre gradually extended his lines north and west, and the Germans had to abandon Amiens and other places in Normandy which they had entered. By Oct. 2 the fighting lines had mounted as far as Arras, where a violent battle developed on the 5th. By Oct. 9 the cavalry screens of both armies had already clashed in the vicinity of Lille (Oct. 8), and were close to the North Sea. By Oct. 20 the western extremity of the line had been extended from its position on Sept. 10 to Lille on the north, while on the east it ran from Verdun south-east, forming a sharp salient on the heights of St. Mihiel, then eastward to the north of Nancy, reaching Arracourt and Avricourt, and thence to Belfort. (See AISNE, BATTLES OF.)

The Drive at the Channel.—On the approach of General von Kluck, in August, the main part of the Belgian field army had retired from Brussels to Antwerp. The spirit of the Belgian troops was high, but they were too weak in numbers for effective accomplishment, while the civilian population indulged on several occasions in a particularly violent form of guerilla warfare, which, in accordance with the very severe German system of reprisals, resulted in terrible destruction of property and life. Heavy fines were, and continued to be, imposed upon the cities. Brussels had to submit to an immediate tax of \$40,000,000. Some British troops which were landed at Ostend on Aug. 27 assisted the Belgians to regain Malines (Mechlin), Sept. 13, and to keep up a fruitless struggle to get at the enemy's rear and lines of communication.

These activities quickly ceased when the Germans began to carry out their new plan. This was to gain control of the northeast coast of France, and drive a wedge between France and England. With Dunkirk, Calais, and Boulogne in their hands, an excellent base of operations against both countries would be obtained. Before this could be done, however, Antwerp and Lille had to be taken.

The siege of Antwerp was begun by General von Beseler on Sept. 27. The city was defended by the main portion of the Belgian active army and some British troops, but, as at Liège and Namur, the great fortress crumbled before the heavy German and Austrian artillery. By Oct. 9 the forts of the first line were taken, and the Germans entered the city (Oct. 10) just after King Albert and his ministers had left for Ostend.

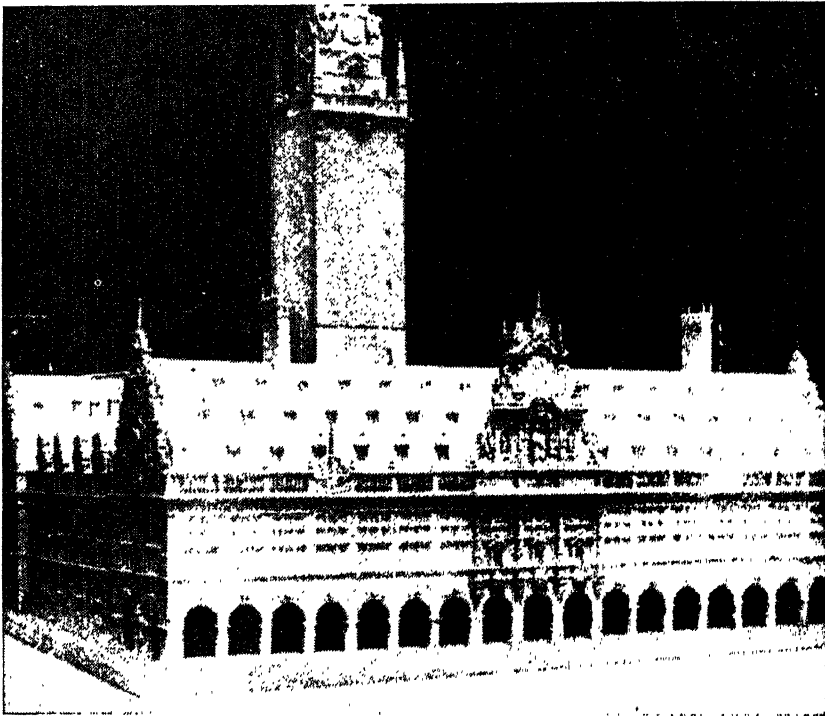
The fall of Antwerp released several German corps for the drive at the Channel ports.

These moved rapidly along the coast. On Oct. 13 the seat of the Belgian government was removed from Ostend to Havre, where the French gave it privileges of extra-territoriality. King Albert remained with his army. Ostend was in German hands on Oct. 15. Meanwhile another Teuton force extending the main right wing captured Lille (Oct. 12).

The Allies were prompt to meet the new move of the enemy. It was decided that Sir John French's army should extend the Allied line from in front of Lille to Ypres

fought (Oct. 27). Against a force greatly superior in numbers, the British held the city, but suffered losses amounting to 50 per cent. (See YPRES, BATTLES OF.)

Austria and Serbia: September, 1914, to September, 1915.—Austria had been unable to devote more than three army corps to the Serbian campaign, and the Battle of the Jadar, in August, had driven the invaders out of the little kingdom. Now, with the help of the Montenegrins, the Serbians were continuing their attempts to reach Sarajevo. They also got back



Louvain Library, restored by American generosity.

and beyond. The Belgians completed the line of defence to the North Sea. Against this the Germans advanced. They were stopped at the Yser between Nieuport and Dixmude, Oct. 18, by the stubborn Belgian resistance. Some German detachments managed to cross the Yser Canal on Oct. 25, but the Belgians opened the sluices and flooded the region and they were obliged to fall back. The attempts to break through extended south through Ypres and La Bassée to Arras. The most violent occurred in the neighborhood of Ypres, where the first Battle of Ypres was

on Austrian territory, and recaptured Semlin on Sept. 10. The Austrians were foiled in an attempt to cross the Save, but before the end of the month the Serbians and Montenegrins were rapidly falling back to the Serbian frontier. Their ammunition was nearly exhausted, and Belgrade had to be evacuated. The following day the Serbians' much-needed ammunition reached them, and presently the arrival of King Peter put new hope into his beaten army. In the mountains southeast of Valjevo, it turned, and with great vigor fell upon the Austrians, crossing the Save and blowing up

the Semlin bridge (Dec. 29). The Montenegrins, although they had lost a third of their little army, repulsed an Austrian attack upon their front at Grahovo (Dec. 28).

From then till September, 1915, the Austrian offensive was abandoned except for slight bombardments, and Serbia, terribly ravaged by typhus fever, was in no condition to resume the initiative.

First Drive of Warsaw.—By the end of September, Germany's ally, Austria, was in serious trouble and in need of assistance. Przemyśl was invested. The road to Cracow, the gateway to Vienna and Southern Germany, seemed to be open to the Russian offensive.

Early in October, the German General Staff undertook the direction of all Austrian operations, and a drive at Warsaw was planned in order to relieve the alarming Russian pressure in Galicia and Bukowina. Four German corps under Von Hindenburg invaded Poland from Silesia, and the siege of Przemyśl was temporarily raised. Austria was saved, but the Grand Duke Nicholas quickly reinforced his central forces against Von Hindenburg, who went back into Germany. With the Germans out of the way, the Russians turned again upon Austria. They reinvested Przemyśl, advanced perilously close to Cracow, and some bodies of cavalry even crossed the Carpathians into Hungary. There was nothing for Germany to do but come to the rescue again. Acting simultaneously with their ally, the Austrians assumed the offensive along the entire front between Czernewitz in Bukowina, and Cracow; but before Dec. 1 they had been beaten back into the Carpathians. For a second time Von Hindenburg was checked. The situation in the East at the end of 1914, except in Bukowina, was like that in France and Belgium.

A New Ally.—For some years Germany had been extending her influence in Turkey. Her hopes of a Pan-Germanic empire in the Near East were in great part based upon her acquiring at least a protectorate over the dominions of the Porte; and German officers had brought the Turkish army and equipment to a high state of efficiency. At the outbreak of the war, Turkey declared her neutrality; although Turkish torpedo-boat destroyers sank a Russian gunboat in the harbor of Odessa, while the *Goeben* and *Breslau*, flying the Turkish flag, but under the command of a German admiral, bombarded Theodosia, and sent a French passenger steamer to the bottom. Diplomatic relations with the Allies were at once broken, and Great Britain declared war upon Turkey on Nov. 5. With their warships, France and Great Britain

blockaded the Dardanelles and Great Britain annexed the island of Cyprus. This event took place three days after the Turks had begun an advance upon Egypt and the Suez Canal. Great Britain declared Egypt free, and replaced the Khedive Abbas Hilmi by his uncle Hussein Kamil, who took the title of sultan and broke all ties of vassalage with Turkey.

The Turks were met at the Suez Canal by the Anglo-Egyptian army and a large body of troops from Australia and New Zealand, on their way to the trenches in Flanders. The chief result of the invasion of Egypt was to keep these men out of Belgium, where they were greatly needed. But they inflicted defeat after defeat upon the Turks, who, after a last attempt to cross the Suez Canal at Tussum (Feb. 2-3, 1915), evacuated the whole of the Sinai Peninsula. With the immediate object of protecting the British-controlled oil fields in Asiatic Turkey, an expeditionary force of Anglo-Indian troops, numbering about 15,000 and under the command of General Barrett, was sent from the Persian Gulf into Mesopotamia. Barrett was opposed by a small Turkish force under Subr Bey. Kurna was surrounded, and on Dec. 9 Subr Bey was forced to surrender. The British captured about a thousand prisoners and nine guns and the possession of the region around Basra was assured.

The Transcaucasian Russian invasion of Armenia was opposed by Turkish troops, of which Enver Pasha was the nominal commander, reinforced by the regular Ottoman fighting force, the Bashibazouks, and Kurdish tribesmen. The reports on this stage of the struggle are too conflicting to be reliable, and many of the so-called battles are nothing more than extensive border raids. However, systematic extermination of the Armenians seems now to have been planned by the self-seeking leaders of the Committee of Union and Progress—Talaat Bey, Enver Pasha, and Shukri Bey, the triumvirate which had usurped the reins of Turkish government. If the atrocities which followed did not have the sanction of Christian Germany, neither did she lift a finger to check them.

Before the end of 1914 the Turks reassumed a vigorous offensive in the southern part of the province of Kars. Here the first considerable battle of the campaign ended, Jan. 4-5, at Sari-Kamysh, in a decisive Russian victory. In the meantime the Turks had been fomenting trouble among the Kurds across the Persian border, instigating them to attack the Russian cantonments. The presence of these Russian troops was in no sense a breach of neutrality,

dating from a period when Persia depended upon Russia to police her frontier. Persia refused to be drawn into the quarrel, so Turkey, interpreting the situation according to her interests, used it as a pretext for invasion. The Turks were checked, defeated, and pressed back to Tabriz, where Allied property would have been destroyed save for the firm stand of the American Consul, Gordon Paddock. By Jan. 30 Tabriz was in the hands of the Russians and the Turks in full retreat. Having won back Artvin in Russian Armenia (April 7), Russia was now re-established within her own territory and remained on the defensive in the north. On the first anniversary of the Great War operations had reached a deadlock.

Naval Engagements: 1914.—When Great Britain entered the war on Aug. 4, the control of the sea passed to the Allies. Germany's battle fleet, the second in size and strength of the world's navies, was compelled to lie sheltered in home waters, inactive except for a few unimportant raids. On Aug. 1, the day that war was declared upon France and Russia, the British Grand Fleet of over 460 vessels sailed for a secret destination in or near the North Sea. The German fleet of about 275 ships was gathered round the Kiel Canal. On Aug. 28 an engagement was provoked in the Bight of Heligoland by Admiral Beatty's squadron of battle cruisers, destroyers, and submarines, which was manœuvring to interpose between the advance division of German cruisers and destroyers and their home base. In the end the German cruisers *Köln*, *Mainz*, and *Ariadne*, and several destroyers were sunk or set on fire, with heavy losses.

With the exception of a few cruiser raids upon the east coast of England, the German fleet attempted no offensive against the British. Yarmouth was shelled Nov. 3, and Hartlepool, Scarborough, and Whitby suffered considerable loss of life and property on Dec. 16. The next German raid started Jan. 24, but the *Blicher* was sunk with 690 men, and the rest of the fleet sought refuge behind the mine fields of Heligoland. After that Germany confined herself to submarine warfare against her powerful adversary. She had more success in the Baltic, where several successful engagements with the Russians occurred.

The Cruisers.—One of the most thrilling pages of naval history in the war is that which relates the adventures of a small number of German cruisers which happened to be away from home when hostilities broke out. Admiral von Spee, commander of the Pacific squadron, was at Kiao-chau with his flagship, the cruiser

Scharnhorst, and the cruiser *Gneisenau*, while the light cruisers *Emden*, *Königsberg*, *Leipzig*, and *Nürnberg* were either there or within call. Two other light cruisers, the *Karlsruhe* and *Dresden*, were in the Atlantic. This fleet was too small in size to protect Germany's colonies, or seize and hold those of her enemies, and it was assigned to interference with commerce.

It was reinforced by four swift ocean liners converted into commerce destroyers. Two of these auxiliary ships came to speedy ends. The *Kaiser Wilhelm der Grosse* was caught and sunk by the British; the *Cap Trafalgar* met the converted British cruiser *Carmania* and was sent to the bottom. The *Prinz Eitel Friedrich*, after nearly nine months of successful preying on commerce in the Pacific and Atlantic Oceans, arrived in Hampton Roads, Va., on March 10, 1915. A month later the *Kronprinz Wilhelm* sailed into the same waters. Both these ships were interned, leaving the cruisers once more unaided.

The *Emden* appeared in the Bay of Bengal Sept. 10, and within a week had captured or sunk six merchantmen. Captain von Müller continued his raiding until 70,000 tons of the Allies' shipping, valued at \$11,000,000, was destroyed. Later the *Emden* made for North Keeling Island, but was sunk by the *Sydney* before she could reach it. The survivors were taken prisoners. The *Königsberg* went to the east coast of Africa. She was finally destroyed in a fight with British river monitors, July 4, 1915.

Admiral von Spee sailed from Tsingtau in the *Scharnhorst*, and with the *Gneisenau* bombarded Papete. Presently he was joined by the *Nürnberg*, *Leipzig*, and *Dresden*; they visited the west coast of South America, where von Spee unexpectedly encountered Admiral Cradock with two British armored cruisers. Cradock was completely defeated in a two hours' running engagement. Upon the news of this disaster, a British squadron under Admiral Sturdee was sent to settle accounts with Von Spee. The action developed into three separate encounters. The *Invincible* (flagship) and *Inflexible* engaged the *Scharnhorst* and *Gneisenau*. The *Scharnhorst* caught fire and sank with Admiral von Spee and all on board; the *Gneisenau* went to the bottom, and only 96 men were saved. The *Leipzig* was destroyed under the *Cornwall's* fire. Meanwhile, the *Kent* overhauled the *Nürnberg*, and she sank. The *Dresden* escaped until March 14, 1915, when she was discovered and destroyed. This action cleared the high seas of all German war-

ships, for the *Karlsruhe* had been blown up by an internal explosion.

Submarine Warfare: 1914-1915.—When Germany found the activities of her battle fleet obstructed by the superior British navy, she attempted to reduce the inequality by the two agents of undersea warfare—the mine and the submarine. Her first attack with the submarine was a startling success. On Sept. 22 one of these vessels torpedoed and sank the British cruiser *Aboukir*, on patrol duty in the North Sea. A month later the German undersea boats began their attacks on the merchant marine. England, in violation of international law, had declared a blockade on all contraband and conditional contraband; the Germans retaliated by proclaiming the waters around Great Britain a war zone, in which all commerce, neutral or otherwise, would be the prey of their submarines. The edict went formally into effect Feb. 18. At first the crews of attacked ships were given time to leave; but presently not only international law, but the principles of humane conduct were violated, in that non-combatants among passengers and crews were given no opportunity to escape.

This campaign reached a climax on May 7, when the giant Cunarder *Lusitania* was sent to the bottom, and over 1,250 lives, including 114 Americans, were lost. This act, joined with attacks upon or the sinking of American vessels, elicited several notes of remonstrance and warning from the United States, but no satisfactory reply was forthcoming; and when the liner *Arabic* was torpedoed (Aug. 19), the tension between the two countries became still greater.

The Colonies.—Another result of barring Germany from the seas was that she could render no assistance to the forces occupying her colonies, and was obliged to leave them to their fate. Thus early in the war Japan drove the Germans in China from the commercially important Kiao-Chau and Tsingtau, and French and British troops took Togoland. Belgian and French troops concentrated against a stubborn resistance from the unit under Captain von Raben gallantly defending Kamerun.

The fall of Mount Mora sealed the conquest of Kamerun, which became Cameroonia once more, the French not only reoccupying the 100,000 square miles they had been forced through Caillaux's agency to yield to Germany in settlement of the Agadir trouble (1911), but receiving as a lion's share of the victory territory almost half again as large. Great Britain retained the administration of some 70,000

square miles adjacent to her own colony of Nigeria.

The conquest of German Southwest Africa, begun late in September, was interrupted for over six months by a Boer rebellion in South Africa, which was started in the middle of October by Colonel Maritz and taken up by Generals De Wet and Beyers. The South African premier, General Botha, was able to crush this uprising after a short campaign. Early in February, 1915, Botha entered German Southwest Africa. Before this, a small South African force under General Van Deventer had managed to recover the British territory of Walfish Bay (Dec. 25), which the Germans had taken, and on Jan. 14 had captured Swakopmund. Botha and Van Deventer now joined forces on the Cape border to the south and marched north through a difficult country, against the determined stand of the German defenders. An advance east from the coast was made by General Smuts' forces. After the capture of Otyimbingue (March 14), the resistance decreased; it was further diminished by a decisive British victory at Gibeon (April 28). Windhoek was entered May 12. With it, some 15,000 prisoners (3,000 of them Europeans) and the high power wireless station fell into British hands. A considerable part of the German forces managed to make their escape northward, and Botha went immediately in pursuit. The retreat turned into a flight, and on July 9 Governor Seitz surrendered the remaining German troops to Botha. This colony is half as large again as the German Empire of 1914.

Toward the end of September, 1914, a force from German East Africa invaded British East Africa, which bounds the former on the north. The object of invasion was the capture of Mombasa, the capital and terminus of the Uganda Railway, but the Germans were held by a small body of Arabs and King's African Rifles—about 300 all told—until the invaders were defeated at Gazi and driven out of the country. In territory east of Lake Victoria Nyanza the British made some progress. Raids and counterraidings gave way in June to an expedition against the fortified port of Bukoba. Germans and their Arabs were routed after a very stubborn resistance. Apart from this, the fighting for the balance of the year was limited to border skirmishes. The Union of South Africa to which had been entrusted this field of operations still had its hands full suppressing unruly Boer elements within its own frontiers.

Little Belgium had been doing her bit by operating with the Franco-British operations in Kamerun, and also held her own against the

Germans on Lake Tanganyika (Oct. 24, 1914). Portugal, having declared herself the ally of England on Nov. 28, found herself forced to defend her African colonies. Opposed by Portuguese reinforcements and threatened by Botha's operations in their own territory, the Germans deemed it expedient gradually to retire.

The German Samoan Islands, with the port of Apia, were peacefully occupied by an expeditionary force from Australia and New Zealand, accompanied by French cruisers, at the end of August, 1914.

The conquest of German New Guinea and the Bismarck Archipelago was effected, with no resistance, by the Australian Naval Reserve under Commander Beresford on Sept. 12. On Oct. 5 a Japanese squadron seized the German Island of Jaluit, in the Marshall group. Bougainville, the largest of the Solomon Islands, was taken by the British on Dec. 30.

The Western Front: October, 1914, to August, 1915.—A military critic has characterized the war on Germany's Western front as one of long battles and short sieges. The story becomes, for some months, one of constant artillery duels along the entire line, desperate and costly attempts to gain trenches over barbed-wire entanglements and across flooded country, close fighting with bayonets and hand grenades—all of which resulted in but small local advantages, and had no effect upon the general situation, except that Germany, realizing that she could not be driven out of France and Belgium, was enabled to exert extraordinary pressure against Russia. Scientists were set to work to invent and devise new methods of warfare, and they produced such curious weapons as asphyxiating gases and flaming liquids. The seizure of the 'ferryman's house,' on the left bank of the Yser (Dec. 2), gave the Allies one of the strongest positions in that region, resulted in the German evacuation of that bank (Dec. 12), and placed the Belgian army solidly on the right bank (Dec. 23). The French stopped several German attempts to cross the Aisne in November and December, but they could make no impression upon the St. Mihiel salient. Nevertheless, the French government had sufficient confidence in the situation to return to Paris on Dec. 10.

The most constant and severe fighting of the winter took place in the Argonne region, where the army of the Imperial Crown Prince established a line after its failure to capture Verdun. Positions were frequently taken and lost, with no decisive advantage for either side until July 16, when the French recaptured most of the ground occupied by the Crown Prince. There

were gains by British and French in the St. Mihiel and Ypres sections. At Ypres the German gas was used for the first time. The Canadian troops here received a grilling baptism of fire. One regiment, which held an advanced position, was almost annihilated by shot and gas. Losses were appalling. Nothing less was required to drive home the fact that such waste must continue so long as the British were inadequately supplied with ammunition and practically without high explosives. The French plan included the seizure of a remarkable steel-and-concrete fortification known as 'the Labyrinth,' covering nearly two square miles south of Neuville-St. Vaast, in the same district. After three weeks of desperate endeavor, the French broke through 'the Labyrinth.' But the German line did not crumble nor did the so-called Battle of Artois compel Germany to lessen her pressure on the Russian front. Preceded by the most violent bombardment thus far attempted, the French general, Pétain, sent over his waves west of the Argonne on Sept. 25, and by the early part of October had advanced on a front of about 15 miles. In the north Foch attacked and seized the western slope of Vimy Ridge, but was halted at this point owing to reverses of the British. The latter had successfully taken Loos through the dashing valor of the Highlanders, who still further penetrated the German lines. The divisions rushed forward to consolidate the positions, could not stand their ground and Foch had to be appealed to for aid. By the Germans this was viewed as a confirmation of British unpreparedness. That it sowed doubts in the mind of the British War Council is evidenced by the early retirement of Sir John French in favor of Sir Douglas Haig.

The Eastern Front: January-February, 1915.—The new year found the situation on the Russian right and centre very similar to that on the Western front. No definite results had occurred. In Bukowina, however, the Russians were driving the Austrians before them. By the end of January they were in full possession of that region, had seized the Kurlibaba Pass on Jan. 16, and were on the point of pouring over the Carpathians into Hungary. This could not be done with safety, however, until the great fortress of Przemyśl was in their hands, for it was the key to the railways and roads of Galicia. General von Hindenburg quickly gathered a strong force, and on Feb. 9 made a vigorous attack on both flanks of the invading Russian army. On the last three days of February a tremendous battle raged around Przysysz, and ended in a brilliant vic-

tory for the Russians. They took thousands of prisoners and an enormous amount of war material. The Russians were now approaching the high mark of their success. After an almost continuous siege of six months, Przemyśl fell. One hundred and twenty thousand prisoners were taken, the way to the Carpathian passes was opened. The invaders were within 20 miles of the Hungarian border. Consequently, the German military authorities felt justified in increasing the force operating against Russia. Von Mackensen began a great drive early in May. His attack was made with a use of siege artillery hitherto unrecorded in the history of war. Batteries were massed, first in tiers of field guns, then howitzers parked behind, and finally the heaviest mobile artillery—from all of which came an uninterrupted stream of shell fire. Against this, the Czar's line was powerless. At the same time, the Archduke Joseph, Austrian general-in-chief, and General Boehm-Ermoli advanced from Hungary. The Russians were badly handicapped by lack of ammunition. Both wings of their armies were bent back, and the centre had to retreat, suffering great losses in prisoners. The Grand Duke Nicholas concentrated heavy reinforcements on the San, in the hope of keeping Przemyśl, but he had to evacuate that fortress on June 3. By the end of the month the Russians were out of Galicia, and back in Poland. Now was the time to strike at Warsaw, and, what was more important, to destroy the Russian armies. Thus, with both their flanks carefully guarded, the Germans in the first days of July drove at the Polish capital and the Russian armies in what was at that time the most stupendous military movement of history. The Austro-German total was over 2,500,000 men. On the 30th, the Russian line broke in two places—on the Vistula between the mouth of the Pilica and Kozenice, and on the Lublin-Kholm Railway near Biskupice. These occurrences compelled Grand Duke Nicholas to give up Warsaw, and draw off his armies before it was too late. Finally, the Blonie line gave way, and it drew back to the defences of Warsaw. On Aug. 4 the suburbs were in flames, and the city itself was bombarded from the air. The main German objective being apparently the capture of the Russian armies, the pursuit was continued. The next Russian line of defence ran through Kovno, Grodno, Bielsk, and Brest-Litovsk. The Germans made this last fortress their goal, and six Austro-German armies were directed toward it. In the middle of September the Czar took personal command of his armies, and sent the Grand Duke Nicholas to

the Caucasus. On Sept. 16, Pinsk, 100 miles east of Brest-Litovsk, fell into Von Mackensen's hands. Meanwhile the Southern Russian armies attempted an offensive in Galicia; and the Austro-Germans made a dash for the stronghold of Sarny, whose capture would put an end to the Russian operations in the south. By Sept. 20 the Germans had inflicted a severe defeat on their enemy southwest of Dwinsk, and were making herculean efforts to trap a Russian army of 300,000 in that region; but the Russians made good their escape, smashing their way through the cavalry sent to bar their retreat. With winter already at hand the Germans now deemed it advisable to return to trench warfare after a campaign of five months in the open, five months of almost unqualified triumph which had not only restored most of Galicia to Austria, but wrested for themselves from Russia all of Poland not already under Teutonic dominion, a large part of Lithuania and Courland and the northwestern corner of Ukraine. The fall of the House of Romanov, the collapse of Russia as a military power, and the birth of Bolshevism may all be attributed to seeds sown by the reverses sustained by Russia during this period.

The Dardanelles.—The Anglo-French attempt to force the Dardanelles and obtain possession of Constantinople had for its objects: (1) breaking the link by which Turkey kept her hold as a European Power; (2) diverting a large part of the Turkish forces from operating against Russia in the Caucasus and elsewhere; (3) striking the imagination of the Balkan States by some heroic performance close to their gates; and (4) giving an outlet to Russia, which, on the closing of the Dardanelles in November, 1914, was quite cut off from the Western world, except through the northern seaport of Archangel (frozen in for some months of the year). The Dardanelles were blockaded with some bombardment, immediately upon the entrance of Turkey into the war; but no attempt to force The Strait was made until Feb. 19, 1915, when a considerable Anglo-French fleet (about 100 ships of all classes), headed by the powerful super-dreadnought *Queen Elizabeth*, began operations at the entrance, and the invading fleet entered the straits which from the Sea of Marmora to the Ægean were thickly strewn with mines. On March 18, Vice-Admiral De Robeck, the British commander of the Allied fleet, opened an attack on the forts at Kilid Bahr and Chanak. For the whole day he poured a tremendous fire upon these main defences of the Dardanelles, while other ships threw shells across the

peninsula from the Gulf of Saros. De Robeck failed in his project, however, and met with great loss from large mines floated upon the attacking ships. The predictions of military experts seemed to be verified. They had stated from the first that such an operation as the penetration of the Dardanelles could not be accomplished without the aid of land forces. A combined land and sea expedition was next organized. The Australian and New Zealand Army Corps which had resisted the invasion of Egypt, and some Gurkha regiments, supported by the 29th Division of British Regulars and the Royal Naval Division, were brought to the Dardanelles. An expeditionary force, that included Senegalese troops, was sent from France. Three major and two minor landings were effected at Cape Helles at a great sacrifice of life. As serious losses accompanied the disembarkation of the Anzacs at Gaba Tepe, to the north on the European side. A small French force seized Kum Kaleh, on the Asiatic side, in order to silence the Turkish batteries there, for they commanded the tip of the Gallipoli peninsula, a narrow and mountainous tongue of land, with a series of abrupt ravines and ridges, and was splendidly defended by the most modern type of German artillery. However, with severe hand-to-hand struggles and fierce onslaughts accompanied by great loss, the Allies attacked and even made some gains. The heat, the flies and dysentery played havoc with the exhausted invaders who sorely lacked both reserves and high explosives and could no longer count on the co-operation promised by Russia on the side of the Black Sea.

At this juncture it was planned to attempt the capture of Sari Bair; but through a series of delays the key position was not attacked until Aug. 8, by which time it was occupied in force by the enemy. This failure ended all hope of success. No further offensive was attempted. Total losses were about 115,000 in killed, wounded, and missing with the sick amounting to some 100,000 more or (in all) more than two and a half as many combatants as the original expeditionary force. Nor were the great losses confined to the land operations. German submarines destroyed three British battleships, several submarines, and a transport. Owing to Bulgaria's decision to throw in her lot with the Central Powers, the vacillation of Greece and the need of man-power in other theatres of war, it was decided in November to abandon all operations against Constantinople. The failure at Gallipoli no doubt influenced the step taken by Bulgaria.

Italy Enters the War.—Italy and Austria had an agreement, as one of the articles of the

Triple Alliance, that neither would take steps toward acquisition of territory in the Balkan peninsula without compensation to the other. Austria remained deaf to Italy's demands for territory until early in March, 1915, when under pressure from Germany, she consented to discuss terms. Her offer was the southern part of Tyrol, known as the Trentino, the Italian-speaking districts on the west bank of the Isonzo, including the town of Gradisca, and the renunciation of all her interests in Albania in favor of Italy, and she further agreed to make Trieste a free imperial city. Meanwhile, the Allies had been definitely sounded with the result that, in addition to the maximum concessions of Austria, Italy was promised post-bellum sovereignty over Trieste, the larger part of the Dalmatian Coast and the Duodecane in return for active co-operation against Austria. The terms of this agreement were incorporated in the Treaty of London signed May 9. War was declared against Austria on May 23, 1915. The strategic plan of the Italian General Staff, of which General Cadorna was chief, was twofold: (1) an advance into Austria against the fortified barrier of the Isonzo River, with Gorizia the main objective, this town being the key to the roads leading to Trieste and the Istrian peninsula; (2) to prevent a counter-invasion of Italy by way of the Tyrolean passes, which had been strongly fortified by Austria. A supporting Italian army was stationed on the plain of Venetia and the foothills of the Alps, ready to move east or west as circumstances might require. By May 25 the Italians were across the frontier and approaching, unmolested, the line of the Isonzo. A brilliant exploit performed by Victor Emmanuel's soldiers was the taking of Monte Nero, a natural stronghold n.e. of Tolmino. This mountain, fortified and defended on all sides, is 8,000 ft. high. The positions were captured one by one, mostly by surprise in night attacks. On June 16 two Austrian battalions were almost wiped out. The Italians swept forward to Gorizia, where a deadlock was reached before protecting forts, which prevented an advance to Trieste.

On Aug. 21 Italy declared war upon Turkey. It was a dark hour for the Allies, for the Austro-German armies were pressing against the second line of Russian defence. There were several ways in which Italy might aid in the operations against Turkey: (1) by sending men and ships to the Gallipoli peninsula; (2) by landing an army at Enos, on the *Ægean*, and opening an overland route to Constantinople; (3) by attempting a direct invasion of Asia

Minor. Owing, however, to her weeks of vacillation, her decision came too late for operations in any of these quarters, and her co-operation in Albania, though of some value, was tardy.

Meanwhile, Gorizia was shelled day and night, from the air as well as land. The crowning effort to Christmas day proved the campaign a costly failure. Austrian estimates placed Italy's losses at 150,000. The hope of the Triple Entente that Trieste could be captured and Vienna threatened was nipped in the bud. Theirs was the slim consolation of Italy's pledge (Dec. 1) not to make a separate peace.

Bulgaria Declares Herself.—With the Russians more or less on the defensive and the British and French checked on all fronts, the German High Command believed the time ripe for the destruction of Serbia. In return for a flank attack on the latter the Bulgarian Czar was to be made over-lord of the Balkans. This final bribe carried the day. On Oct. 8, 1915, Sofia published this manifesto: 'Bulgaria must fight on the side of the victors.' Ferdinand's illuminating self-diagnosis compelled the Allies to sever diplomatic relations on Oct. 11. Bulgaria invaded Serbia on the same day, three days before her formal declaration of war which evoked Great Britain's on Oct. 15 in spite of Ferdinand's protestation that Bulgaria had no quarrel with the Entente Powers, but only with her 'treacherous' neighbor, Serbia. France's declaration of the next day was followed on Oct. 19 by those of Italy and Russia, the latter stigmatizing Bulgaria's conduct as an act of fratricidal aggression.

Crushing of Serbia.—The fall of Warsaw augured a fresh attack on Serbia. The Allied Command must have had some inkling of this; but the support promised to Serbia was slow in materializing. Serbia faced the Austro-German hordes alone.

Still, though outnumbered over two to one, the 150,000 veterans under Marshal Putnik were a match as fighting material for the armies of Von Mackensen. Only his heavy artillery could definitely turn the scale. Subjected to its concentrated fire, the Serbians must inevitably fall back, but, with their rear secure, might count on aid from the Allies in time to avoid a *débâcle*. On Oct. 11 the Serbians succeeded in driving the German right wing back across the Drina, only to learn that the Bulgarian invasion had actually begun. When Vranja fell the defenders of old Serbia found themselves in a precarious position. Only the difficult roads of western Serbia remained open for their retreat and the Bulgarians were rapid-

ly reducing this margin between disaster and destruction.

From Oct. 12 to the end, the Allied commander, General Sarraill, distinguished for his services at Verdun, used the limited and heterogeneous forces at his disposal as effectively as time and opportunity permitted. Not until Oct. 14 was he given anything like a free hand, and then freedom was handicapped. The Serbian railways were now under enemy control. The Serbians, though exhausted, made a supreme effort in what is known as 'the Manœuvre of Katchanik' (Nov. 4-8). It proved futile, and with the failure of the French to join and support the handful still holding the Babouna Pass, the gateway to Monastir, Serbia's last hope vanished. From this moment what had been at first a strategic retirement, then an orderly retreat, became for the Serbian armies the flight of a war-worn, starving rabble, whose only chance of escape lay through the rough passes of Montenegro and Albania leading to the Adriatic. More than 100,000 men had been lost and most of the artillery and equipment. Old King Peter, broken by sickness, was a fugitive, an exile. Italy covered the debarkation of the remnants of the army to Corfu.

From the Teutonic point of view another dream or, rather, carefully planned project, had been realized. One of the primary objects of the Great War had been accomplished in ten weeks. The road was open to Bagdad—and India.

Serbia had been crushed. Roumania could be crushed if intractable. The British in Mesopotamia should be crushed. While Bulgaria did police duty in the Balkans, the victorious armies of Germany and Austria were released for service against Verdun and the Trentino.

Montenegro's King Sues for Peace.—The hardy Montenegrins had done their bit in repelling Austria since her declaration of war, Aug. 9, 1914. During the autumn of 1915 they had fought as only highlanders can fight, in the Drina sector; but now, as winter set in, they found themselves between the Teuton and the Albanian. No aid could come from Serbia, their senior partner in defeat, nor from Russia, who was still yielding ground; and from Italy no assistance was forthcoming in spite of urgent appeals. Invasion followed swiftly. Ipek, the chief town of the easterly spur gained by the Balkan War, was occupied by the Austrians on Dec. 6. When the Austrian advance, accelerating, swept down from the west and led on Jan. 10, 1916, to the bombardment of Mount Lovcen, the 'Gibraltar of the Adriatic,' Montenegro was doomed. Cetinje, the capi-

tal, was occupied on Jan. 13. The King at once pleaded for an armistice and, accepting its rigorous terms, ordered the army to capitulate (Jan. 17). The army, however, was made of sterner stuff and balked, many units refusing to lay down their arms. Russia and now Italy made vigorous protests. The *contretemps* which followed remains rather clouded but there is no question that a so-called peace agreement was negotiated on Jan. 25 between certain Montenegrin officials and Austria's representatives.

While Montenegro had not pledged herself to stand or fall with the Allies, her submission damaged her prestige and virtually ended the reign of her king, who had abandoned his country on Jan. 18, leaving his son Prince Mirko to shoulder all further responsibility, and took refuge in France—first in Lyons and later in Paris—as pensioner of the French government. His people were disarmed, then practically enslaved, and, later, if at all rebellious, deported like the Serbians.

The Caucasus and Persia.—Meanwhile, the Grand Duke Nicholas, relieved of his command of the main army on the Russian front, had been made Viceroy of the Caucasus with the direction of all its forces (Sept. 8). A new campaign was organized, and the Russians fully reinforced, began a major drive on a front of more than 200 miles, from beyond the Persian border to the Black Sea. The Turkish retirement was followed by the fall of Hassan-kala and Kopri-Koi (Feb. 12) and opened the way to Erzerum, which is protected by the strongly fortified ridge of Deve Boyun, 6,800 feet high. This powerful barrier was bombarded, beginning on Feb. 12. One army attacked from the front, a second swept down from the north, cutting off a part of the ill-fated Tenth Corps, while a third forced the lightly held southern defences after an approach over heights that had been considered impassable. By this feat, performed by the Siberian troops, Erzerum, the eastern gate of Asia Minor, fell on Feb. 16. By this time the Russians of the main right wing of the invasion had routed its adversaries east of Tortum; but further advance on Trebizond, their objective, was checked by the strongly defended gorges and hills which commanded the crossing near Baiburt. Meanwhile the army of the left had driven the Turks before it and pressed on towards Mush, which it occupied, together with Akhlut, on the west shore of Lake Van, on Feb. 19. Joining the forces from Erzerum, it now launched an attack against Bitlis, which was taken in a snowstorm on

March 2. The Russians were now less than a hundred miles from the Aleppo Railway. The Turks were compelled to fall back to Trebizond, which was being shelled from the sea, and now threatened by an assault from the west, where a second force was disembarking, they withdrew from the city, the Russians occupying it on April 18. Baiburt itself yielded on July 16 after a succession of fierce engagements.

In Persia the situation for the Allies had long been grave and delicate to handle. Persia had become the eastern headquarters for the dissemination of German propaganda. When it became apparent that the Shah was about to be won over by the representatives of the Central Powers, the Russians marched on the capital. Teheran was occupied and on Jan. 8 General Baratov reviewed in that city the Shah's 'Cossack Brigade.' But Turkey had not been napping. Fully aware of the attempt to attack Bagdad from the north, she had dispatched a force of Kurds, supported by regulars and officered by Germans, across the border to Kermanshah, which it entered on Jan. 14. This move had been accomplished in the nick of time. From now on the Russian flanks were harassed by local tribesmen; but the main Turkish opposition at the two principal passes was finally destroyed on Feb. 25 and the Russians were able to occupy Kermanshah a few days later.

During the corresponding period, skirmishes had been occurring south of Teheran between the Cossacks and the Persian gendarmes officered by Swedes. The latter had been completely routed, leading to the occupation of Kum, of Kashan, and eventually Ispahan on March 19, 1916. The British, on the other hand, had undertaken the pacification of Southern Persia and by June 12 were established in Kerman, its principal town. July found Russia only 80 miles from Bagdad, where General von der Goltz was directing the operations against Kut. But Russian successes in the northern and strategically vital part of this region were about to receive something more than a check.

Taking advantage of the summer heat, so exhausting to the northern invaders, the Turks now launched a vigorous counter-drive against Kermanshah, which had to be evacuated on July 5. They next turned their attention to the north and cleared out the Russians along the Persian border as far as Sekiz. The Russian menace from this quarter seemed definitely checked.

As the second year of the war drew to a close

miles. It brought about his temporary eclipse, for Verdun was registered as a colossal failure. Pétain's counter-offensive planned in September, 1916, continued with the re-establishment of the French, on Dec. 15, at Vacherauville (on the Meuse), Pepper Ridge, Louvemont, Bezonvaux, and the balance of the Hardaumont defences, and the capture of more than 10,000 prisoners and another large accumulation of supplies. Of all Germany's hard-won gains she now retained none of importance on the east side of the Meuse. The final stage occurred during the summer of 1917. At the instance of Pétain, now Commander-in-Chief of all the French Armies, the attack was resumed on the west of the Meuse. By August 26, Hill 304 had been captured, too, and the Germans forced back to lines approximating those of Feb. 21, 1916.

Germany had intended to bring France to her knees, and, failing this, to bleed her white. Instead of which she had bled herself grey, losing fully a quarter of a million men, almost twice her total casualties for the Franco-Prussian War.

Kut-el-Amara.—The initial operations in this theatre have been covered in connection with the movements following Turkey's espousal of the Teutonic cause. It has been shown how by the middle of December, 1914, the British under Barrett had established themselves at Kurna. With the oil fields comparatively secure, the invaders rested on their arms, awaiting the reinforcements essential to further advance. In April, 1915, a second division arrived under General Sir John Nixon, who now directed the combined forces. The Anglo-Indians, spurred on by the desire to outshine their comrades at Gallipoli, drove all before them. Having captured Nasariyeh, principal stronghold on the middle Euphrates, on July 24, 1915, Nixon made Kut-el-Amara his objective. This town, so called, is situated about 250 miles from the Gulf, so that, considering the small force and very limited supplies and transport service at Nixon's disposal, his communications were to be dangerously extended. However, lured on by a chance at Bagdad, the India Office persisted on this venture. 'The Turks fought stubbornly,' says Gen. Nixon, 'and were saved from complete destruction by the approach of night.' Owing to the exhaustion of the British through heat and lack of water, the pursuit could not be attempted until the next day. The Turks, therefore, were able to fight a successful rearguard action and managed to reach another series of defences at Taki Kesrah without further seri-

ous reverses. Their defeat at Kut, however, gave the British full control of Basra Vilayet, brought disgrace on the Turkish general, Nured-Din Bey, and was for the time being a feather in the cap of General Townshend, the immediate commander of the assailants.

By Nov. 22 Townshend's main body had pushed forward to Ctesiphon, only 18 m. from Bagdad, a tempting bait to Great Britain, eager to join hands with Russia, and form a barrier between the Central Powers and Afghanistan, the gate to India. But here the little army was all but overwhelmed by the Turks, powerfully reinforced since the Allied repulse at Gallipoli. In spite of a successful counter-attack the next day, it became apparent to Townshend that his position was untenable. Shortage of water necessitated an immediate retreat. The retirement was conducted with masterly skill and comparatively small losses up to Dec. 5, when, finding himself pressed by the enemy, Townshend was forced to give battle with his rear guard so as to insure the escape of the bulk of his army, which was ordered to proceed down the Tigris. Its retreat was successfully covered, but Townshend and his 10,000 men suffered defeat and were compelled to intrench at Kut-el-Amara. By Dec. 8 his communications had been cut. He was isolated.

As soon as the gravity of Townshend's predicament was fully realized, a relief expedition of 30,000 men was organized in India, with General Aylmer as field commander. The hastily improvised transport service was inadequate to the needs of such an army and doomed the relief to failure. It was four weeks from the date of Townshend's investment before Aylmer was able to push his way up to Sheik Saad, some 20 miles from his objective. Aylmer forced a crossing of the Wadi, pursued the Turks to their Umm-el-Hannah defences, about 20 m. from Kut, and, intrenching, succeeded in blocking the egress of the enemy's right. Three heroic attacks were launched but to no purpose. Aylmer had used all his effectives. Menaced by floods, threatened with a repetition of Townshend's fate, he was compelled to retreat to his base at Imam Ali Gherbi.

In the meantime the British High Command had taken the matter out of the hands of the India Office and dispatched from Egypt a strong force of fully equipped Colonials and fresh material for the river operations. General Lake was sent to the scene and reorganized the plan of campaign. A start was made from Gherbi in February. The attack was to be di-

rected this time against the Dujailah Redoubt and the lines running south of the Tigris. The country was flat and open, an ideal terrain for the defence. In spite of this, a handful from several English units actually reached the redoubt, making the nearest approach to beleaguering Kut, some 9 m. behind the Turkish works. The main attack, however, was hurled back with severe losses. The rest of the month was spent fighting floods as well as Turks. The odds were too great. The British losses to date amounted to over 8,000 men. The offensive had to be suspended. 'I need not enlarge upon the bitter disappointment felt by all ranks,' wrote General Lake, 'at the failure of their attempt to relieve their comrades at Kut.' And it was a failure that cost Great Britain 23,000 men.

These comrades in the meantime had been gradually reduced to starvation in spite of daring efforts to send them supplies by airplane. On April 29 Townshend was compelled to surrender unconditionally to Khalil Pasha after a resistance of 143 days. England learned for the second time within a year the cost of seeking to emulate Xenophon in a country where the enemy was in vastly superior numbers, equipped almost as well as she and directed by a power perhaps her superior in strategy.

The Trentino and Gorizia.—Screened by the Dolomites, Austria had been massing for months *via* Botzen and the Brenner Pass a force of some 200,000 men and 2,000 guns with which she purposed to diverge along the pass from Trent, send flying the Italian vanguard in Tyrol, rapidly debouch on the enemy's highlands and, crushing with a few swift, heavy blows its demoralized defenders, sweep victoriously down on the Venetian plain. The campaign was launched, with the usual concentrated artillery fire, on May 14, 1916. For ten days their progress was comparatively unchecked. General Cadorna, however, had not been idle, and on May 25 was bringing up strong reinforcements for a counter-stroke. A general retirement of the Austrians was under way by June 26. The Italians by this time had at their disposal a considerable number of heavy guns and hoped to smash at last through the eastern barrier, encircle Trieste, the goal of the Irredentists, and completely turn the tables on Austria. With all three objective attained, on Aug. 9, 1916, the Duke of Aosta, commander of the victorious army, entered Gorizia with the King. By Aug. 11 the Austrians were compelled to withdraw to the east of Vallone and the Italians were able to occupy

the whole of the Doberdo Plateau immediately below the main heights of the Carso.

Upon these bleak heights the Austrians stood fast in a second line of defences to which the grey limestone of the plateau lent itself perfectly. The main attack of the Italian right now centered against the enemy's line from opposite Hill 242 south to the sea. Oppachiasella fell on Aug. 12. Nearer to the coast, Hills 85 and 121 were finally taken after desperate assaults. On Aug. 16 a foothold was secured on Monte Pecinka. On the left wing, meanwhile, the Italians had reached the outskirts of Tolmino. Finally, on Nov. 3, Monte Pecinka was cleared, and the next day the Italians were pressing up the Vipacco Valley. On the coast they were within 13 miles of Trieste. Cadorna, like Brussilov and Haig, had shot his bolt. However, its weight had scored him 42,000 prisoners, 60 guns, and 'rich booty.' Until Italy received fuller financial backing from her allies, for munitions with which to curtail her charges, the courage of her men could never achieve the success which it deserved.

Russia's Last Blow.—The Central Powers had believed Russia incapable of taking the initiative for months to come; yet now an offensive was suddenly launched with terrific fury by General Brussilov, from the Roumanian border to north of the Pripet River. An avalanche of fresh, youthful troops swept over the Austrian positions. The front chosen for Brussilov's drive screened Kovel, Lemberg and Stanislaw, all three railway centres of the utmost importance to the Teutonic armies; the first being an indispensable link between the Austrian and German forces, the second the main feeder from Hungary. As far back as April the Russians had shown a certain activity further north from Pinsk to Riga. Local engagements were frequent and just before the big drive Evarts and Kuropatkin had attacked on a front reaching from Baronovichi to the Dwina, but Leopold of Bavaria had stood his ground. These operations had been in the nature of a blind. At all events, the blow delivered by Brussilov does not seem to have been expected. The Russians swept onward from Rovno to Olyka, some twenty miles in two days, and on June 8 recovered their fortress of Lutsk, capturing that of Dubno on June 11, thus controlling once more what, with Rovno, formed the 'Vollhynian triangle.'

Crossing the Styr to the north and south of Lutsk, Kaledin's cavalry now pressed on towards Vladimir-Volynski and Kovel, his principal goal. A week's fighting had driven the Archduke Joseph back forty m.; his army was

in full retreat. The Prussians pressed on to Przemloka, where, however, they met a stone wall in Von Bothmer. Boehm-Ermoli, to the north, also managed to check Sakharov's rush towards Brody on the railway to Lemberg.

To the south, on the other hand, Lechitsky's progress was a succession of triumphs. The Russian gains in this region were even larger than those to the north. In the shadow of the Carpathians on July 19, by the 23rd he had driven the Austrians into the Jablonitz Pass and was within 4 m. of the Hungarian border. His other columns were operating against Stanislaw and Von Bothmer's right, where, since July 9, the pressure had begun to tell. Stanislaw, the southern goal, fell into his hands on Aug. 11; and Von Bothmer's right fell back upon Halicz but in good order. On Aug. 15 Jablonitz, that war-worn pass into Hungary, was finally taken.

Almost upon the heels of the official claim (Aug. 16) that she had captured in this theater alone more than 358,000 prisoners, 405 cannons and 1,326 machine guns between June 4 and Aug. 12, Russia's armies showed signs of being foot- and heart-sore. The price of her advance had been terrible, almost heartless. She had crippled Austria, but had not won a decisive victory over the Central Powers. Germany was still to be reckoned with. Gradually, for lack of munitions, the great drive lost its impetus; imperceptibly, for lack of fresh martyrs, its momentum diminished. And this was occurring as the Austrians were being reinforced by Bulgarians and large bodies of Turks and, above all, German divisions; at a time when the machine was being placed under the supreme command of Von Hindenburg. In the Carpathians the Russian offensive was more sustained. Here the Russians were cheek and jowl with their eleventh-hour allies, the Roumanians. Early in August, Kuropatkin was made Governor-General of Turkestan, the Riga-Vilna group of armies being placed once more under the command of General Russky. Under his leadership the Russian line was a rock. But to the south the Austrian line now managed to remain almost as firm. Russia's main chance had already been lost.

Battle of the Somme.—As we have seen, the winter on the Western Front had been a seesaw of defeats and victories accompanied by great losses, especially at Ypres. Now with the Germans repulsed at Verdun and the Italian and Russian victories in their drives, the Allies' hour for a drive struck when the Austrians were checked in the Trentino and driven from Bukowina.

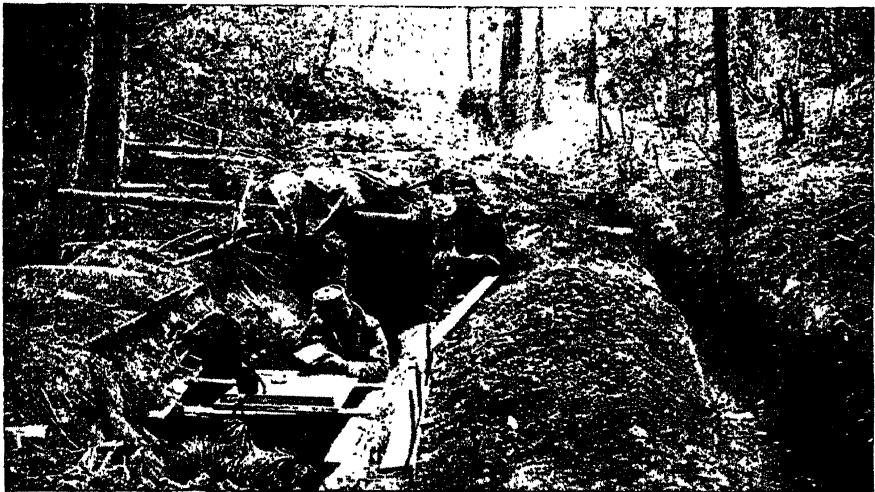
An Allied attack was to be made in successive stages against defences previously demolished by artillery, each stage to be undertaken by fresh units. Thus was this outlying frontier of Germany to be penetrated, Teuton reserves detached from the battering-ram on the Meuse, and Russia and Italy given free rein against Austria. Among other objects, to quote General Haig, it was to wear down the strength of the forces opposed to the Allies. Thus began the Battle of the Somme, which lasted until Nov. 18, 1916, the success of which evidently came as a surprise to the enemy, and caused considerable confusion and disorganization in his ranks. The Allies could congratulate themselves on the capture of no less than 80,000 prisoners and their equivalent in material, also upon the ejection of their enemy from the ruins of some forty French villages in keeping with a completely devastated countryside of about 200 square miles. The recovered area was geographically small; on the British side alone had fallen probably half a million men; and in its defence the Germans used up no less than 133 divisions. But it was something more than a duel between Haig and Foch as against Rupprecht of Bavaria. It was a test of Anglo-French, more especially British, strength. In this it more than succeeded. France proved herself as vigorous as ever in the attack and England's democratic New Army showed itself more than a match in courage for the soldiers of a military autocracy. And the machine had improved: England had awakened at last, 'The Somme,' as a war critic has aptly expressed it, 'was the first expression of the true military power of an organized Britain.' After twenty weeks of warfare waged within the enemy's lines, Haig made the modest statement: 'The enemy's power has not yet been broken, but the Somme battle has placed beyond doubt the ability of the Allies to gain their objects.' Marshal Haig, himself, later recognized the battle as but one of many correlated struggles, expensive details, incidental to the grand decision of November, 1918. It was the first great attack by the Allied left wing. For a detailed description of the battle in all its phases, see SOMME, BATTLES OF.

Salonica and the Greek Question.—The Salonica campaign and Greece's relation to the war are too closely interwoven for separate consideration. The Allies landed at Salonica early in October, 1915. This was done with the quasi-permission of the Greek Government, whose king, Constantine, was a pro-German, whose premier, Venizelos, a staunch adherent of the Allies. When the latter was forced out of

office (Oct. 6, 1915) the mainstay of the Entente was removed and with him Serbia's last chance of relief. By the dissolution of the Greek Parliament, the Allied army had found itself in a hazardous position which had impaired whatever assistance its small numbers and nondescript composition might have rendered the Serbian cause.

Kitchener had reviewed the situation at this port, visited Athens (Nov. 20) and seen King Constantine, whom he sought to impress with a laconic exposition of Allied power. Failing here, as they had failed through more diplo-

came under their observation. The situation was as insupportable as it was anomalous, and on Dec. 30 the consuls of Germany and her following were arrested and shortly shipped away, to be released with safe-conducts. Meanwhile about 130,000 Serbians were being refitted and reorganized on the island of Corfu and arrangements were being made (April 15-May 15) for their transportation *via* the Peloponnesian Railway and Piræus. For reasons not difficult to guess the blind was allowed to cover their actual passage by sea. Before the end of May they had all landed at Salonica.



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A section of Trench in the Argonne.

matic channels, the Allies, claiming as an extenuating circumstance Greece's non-fulfillment of her pledges to Serbia, instituted what amounted to an economic and commercial blockade and in due course occupied many of the Aegean Isles, Corfu (Jan. 11, 1917), and such portions of Macedonia as were essential to their immediate ends.

Sarrail had spent the first six months of 1916 in (1) converting Salonica into an entrenched camp powerful enough to ward off the German thrust which was scheduled to take place under Von Makensen; (2) improving its harbor, building piers, and supplying better railway and road communications, and (3) strengthening the front line. All of this was done in spite of a thousand and one obstructions on the part of Greece. Furthermore, remaining officially a neutral port, Salonica housed the agents of the Central Powers. Every move of the Allies

Just after the pseudo-agreement had been wrung out of a protesting Greece, she neutralized it by a counter-act of covert treachery. Though not at war with Bulgaria, her garrison at Fort Rupel surrendered to the Bulgars on May 26. The stronghold guarded the pass of that name through which run the Struma River and the highway to Seres. Occupying it, the Bulgarians were in a position to sweep south and east. They became a serious menace to the Allied right. Sarrail had laid his plans for a grand offensive up the Vardar River when out of a clear sky came a Bulgarian offensive in the west. This, together with the seizure of Rupel, frustrated his strategy. The Serbians were holding the sector now threatened. Between the Serbians and the Bulgars were a few Greek frontier guards. These vanished in thin air during the night of Aug. 17, enabling the invaders to make short work of the few scattered

Serbian before Florina. The Bulgars were 12,000 strong. The Danube Division, outnumbered two to one, fell back fighting all the way to Lake Ostrovo where, covering the all-important railway to Vodena, they hung on till sufficiently reinforced by their own divisions and the French to successfully repulse five attacks on Aug. 22.

During this period the resentment of the Macedonian Greeks over the Bulgarian occupation had been rising to fever heat. The Bulgars were quietly making themselves master of the region to their western frontier. The Greek garrisons were requested to leave Seres and Drama (Aug. 30) and a column was advancing on Kavala with a view to clearing the whole coast. The Florina incident brought Macedonian resentment to a head. By Aug. 30 it found expression at Salonica. Convinced that Macedonia was being systematically sold to Bulgaria by the King, there was a clash between the Royalists and the Venizelists, in which the latter, in the majority, won the day and broke definitely with Athens. A Committee of National Defense under Col. Zimbrakakis called upon all patriotic Greeks to align themselves with the Entente against Bulgaria.

While this revolutionary movement was making headway through the north, Sarrail's assault began in the west, Monastir his objective. In these operations were engaged the Serbians, the French, and later on a Russian contingent. At Kenali they found themselves stopped short. Here the Bulgars made a long determined stand, but after many attacks and counter-attacks, the Bulgars were forced to retire and evacuate Monastir (Nov. 19, 1916), which was thereby recovered on the anniversary of its capture by the Serbians in 1912. Meanwhile the British had been holding the Bulgars on the Struma. As the Monastir drive was in progress, Venizelos and his colleagues, breaking with the King, had slipped out of Athens and proclaimed an independent government in Crete, the Premier's birthplace. On Oct. 9 he appeared at Salonica and made it the headquarters of his party; a week later his provisional government was recognized by the Entente. All this time the latter had been having trouble with Athens and on Oct. 11 most of the Greek navy was taken over by the French. Intrigue followed intrigue. Fearing hostile action, the Allies demanded the surrender of certain artillery and munitions. The King refused (Nov. 30). The Allies still negotiated but now by ultimatum (Jan. 8, 1917). Athens affected to submit (Jan. 16); the Greek army

was to be removed from Thessaly, but—only in principle. Other conditions were evaded as well. At last the Allies lost patience. On June 10, Old Greece was invaded, Larissa entered and before long Thessaly had been more or less pacifically occupied and its natives disarmed. In the meantime, on June 12, King Constantine had been compelled to abdicate in favor of his second son, Alexander, on the 27th Venizelos was reinstated as Premier, and on July 2 Greece declared war on Bulgaria and Germany.

Roumania.—During the first month of the war Charles I. of Roumania exerted every influence to the end that she should align herself with the Central Powers. Upon the death of Charles and the ascension of Ferdinand his nephew (Oct. 11, 1914), any leanings which Roumania may have had towards Germany were counterbalanced by the pro-Ally bias of her new Queen, Marie, a strong-minded British princess. If Roumania continued to remain neutral, it was primarily because she lacked both the means and the opportunity to assume the offensive. Russia's retreat of 1915, followed by the swift extinction of Serbia, nipped in the bud any thought of intervention. The Allies recognized this and the value of Roumania as a buffer state.

The moment for action seemed to have arrived when the Teutons were on the defensive in France, Italy and the Russo-Galician front. Already Ionescu, Roumania's pro-Entente mouthpiece, had made a passionate appeal for war. The people seem to have been behind him. Without doubt he was an honest patriot, but equally certain is it that the Crown Council which declared war against Austria-Hungary on Aug. 27, 1916, however much in its favor, had been bludgeoned into so doing by Russia. Roumania was forced to choose between war against the Central Powers and invasion by Russia with the concomitant dismissal of her territorial claims in the north. Roumania's entry was hailed with rejoicing in the war capitals of Europe. For London, Paris and Rome it seemed to presage a triumphant issue for their cause. In Berlin, Vienna, and Constantinople triumph seemed as certain, but the cause was their own. At Petrograd there was furtive self-congratulation; the lamb was to be led to slaughter so that the bear might hibernate, then terrorize the countryside once more. Roumania had been betrayed.

Assured by Russia that Bulgaria's neutrality could be depended upon, and pressed by the same taskmaster to invade Transylvania for strategic reasons, Roumania promptly penetrated that region with three of her four armies.

The southern Carpathians with their western prolongation, known as the Transylvanian Alps, form the natural frontier between Roumania and Hungary. Roumania's plan contemplated the early occupation of a territory inhabited by her own kin, a material reduction in her front, which would then extend straight from Bukowina to the Iron Gates and be fed by railways which linked her own armies with the Russian. So far, so good; but only a single army was left to guard the Danubian border and the Dobrudja. The success of the northern strategy hinged on non-interference from the south.

The invasion under General Averescu proceeded as planned. By Sept. 8 the Army of the North had reached the Maros Valley.

In the meantime, Bulgaria had thrown off her mask (Sept. 1, 1916), and the situation on that border became exceedingly grave. A cloud, a storm-cloud darker than the Bulgarian, was whirling down upon this front. Some thirty German divisions, not less than 500,000 at the close, organized under Von Falkenhayn, still stinging from the Verdun check, were spared for the conquest of Roumania. The storm burst on Sept. 20, 1916, with an attack before Hermannstadt. Here the Roumanians were severely beaten (Sept. 28-30) and one column driven back on Vulcan Pass, where a struggle had been going on since Sept. 21. The right had been cut off and compelled to escape towards Kronstadt. Thus was the First Army disorganized. The Second, its left in the air, had to abandon Fogaras (Oct. 6) and give battle before its original objective. Here, too, the Roumanians suffered defeat. The Army of the North was left no alternative other than a general retirement (Oct. 12). The story of the successive engagements for October, November, and December was one of desperate defenses by the Roumanians in the passes and on the plains. But in October Roumania's main water connection with Russia was broken; by the end of November all the Roumanian forces west of the Alt were compelled to surrender; and the German main body under Von Falkenhayn was swinging towards their capital, Bucharest. Von Mackensen joined in this advance with his army and on December 7, 1916, the capital was occupied by the Germans, the government having moved to Jassy (Nov. 28-30). Russian contingents had arrived and took part in the final stand on the Argesul, but they came too late to turn the scales in Roumania's Battle of the Marne. By Dec. 8 she had lost over half of her territory and more than 300,000 men, of whom at least one-third had been taken pris-

oners. After this, it was only a matter of time before the remains of her First and Second armies should be defeated and the rest of her territory captured. By the middle of January Roumania had been cornered and fought to a standstill. Only a section of Moldavia remained in her hands. Her part in the Great War had virtually ended.

Before this, apace with the retreat, had occurred the destruction of all the crops and oil refineries. Night had been turned into day by the firing of the oil wells. Nothing was to be left to the Germans. Von Mackensen, nevertheless, secured a vast amount of grain, while the loss of the gasoline supply only tended to harshen his treatment of the civil population. On Jan. 13, 1917, all the neutral diplomats left Bucharest at the request of the German authorities. A fortnight later began the deportation into Germany of all males from 16 to 67. In June a fine of \$50,000,000 was placed on the conquered territory.

In the meantime, Roumania's handful of an army had stood firm, their backs to the wall; her king had refused to entertain negotiations with the Central Powers, and her queen, an ever powerful and heartening factor in the councils of the nation, had pledged the country to fight to the last ditch. But later, upon the suspension of hostilities all along the Russian front (Dec. 6, 1917), Roumania was to be compelled to associate herself with the Trotzky program. It was not till then that, threatened with a stoppage of food from Russia, on Dec. 10 she signed a three months' armistice. The final Treaty of Bucharest (May 6, 1918) left Roumania shorn of all but a nominal sovereignty. By it she returned to Bulgaria that part of the Dobrudja ceded by the latter in 1913 and gave to the Central Powers (Germany) the balance of the seaboard and to Austria-Hungary the passes of the Carpathians and the ridge of the whole range, in all some 3,650 sq. m. To the Central Powers went also the control of the Danube and wheat, salt, and petroleum concessions prolongable to a long term of years. Her army was to be reduced to a body of about 31,200 men, while the German army of occupation, maintained by the conquered, was to remain for the enforcement of Roumania's self-spoliation. Demobilization was ordered on May 16; and on July 6, 1918, the treaty was ratified by the Senate. Roumania was humbled to the dust.

Suez, Aden, and the Arabian Alliance.—In spite of an official report current in Rome, Dec. 17, 1915, that the Suez Canal was to be attacked again at an early date by a combined

German and Turkish force, nothing developed in this region for months to come. At last on July 22, 1916, the Turks were discovered to be advancing in force along the coastal caravan route and by the last day of the month had reached within nine miles of Romani, s.e. of Port Said. Exhausted by their long march across the desert, their defeat (Aug. 4, 1916) was only a question of hours. The attack was repulsed everywhere on a seven-mile front by British Territorials and Australian cavalry, who turned the defeat into a rout and, on the following day, pursued the enemy some eighteen m. Thus ended the much-advertised occupation of Suez, blockade of India, and conquest of Egypt.

Far south on the Arabian Peninsula, the Protectorate of Aden, which guards the entrance to the Red Sea, had been the object of several attacks, the first of any importance on July 9, 1915. From the Turks in this quarter, Great Britain was not to be threatened much longer. For months there had been a gradual rapprochement between the Allies and the semi-independent Arabs on the Red Sea. On June 27, 1916, El Husein ibn Ali, the Grand Sherif of Mecca, rose against the rule of the clique of Enver Pasha, proclaimed the complete independence of Arabia and openly declared in favor of the Allies. By September he had seized all the chief cities on the coast of the Red Sea and begun the administration of the region (24,000 sq. m. with a population of about 3,000,000) under the title of Suleiman I., King of Hejaz, a name taken from the province in which the holy cities of Mecca and Medina are situated. He was officially congratulated by the British and French Governments, who granted him a substantial subsidy in return for aid against the Turks and gave him formal recognition on Jan. 8, 1917. Many tribes from the interior flocked to his standard and peace was patched up between the sheiks of the two biggest and most powerful rival tribes near Damascus and Aleppo, these chiefs consenting to raise a large body of horsemen to serve against their former ruler.

East Africa.—In the fall of 1915 General Smith-Dorrien of the Second Army in Flanders had been transferred to South Africa for the purpose of organizing and directing its forces against German East Africa. General Smith-Dorrien unfortunately fell seriously ill in Cape Town and on Feb. 9, 1916, the supreme command was made over to General Smuts, leader of the Southern Army in German Southwest Africa. Three brigades of South African and Anglo-Indian troops, roughly, 12,000 men,

were placed at his disposal. The German forces, according to his estimates, numbered about 16,000, of whom 2,000 were whites with 60 guns and 80 machine-guns. General Smuts undertook as a preliminary the occupation of Moshi at the head of the Usambara Railway. The defenders were surprised and defeated, and Moshi was captured on March 13. The main column under Smuts now marched south-east on Tanga, subduing the highlands of Usambara and securing control of the railway and region between them and the Pangani River, the German forces falling back on Pangani and abandoning the port of Tanga on July 7.

Meanwhile, a column under General Van Deventer, who had made a name for himself in the campaign against Southwest Africa, had been marching southwest. It was one long fight all the way through the Masai country; but in succession he occupied Kothersheim, Salanga, and Kondoa Irangi, the last on April 19, 1916. In the case, Smuts, possessing in Tanga an excellent harbor and base, had been moving down the coast on Dar-es-Salaam. With the aid of the navy, Saadani was occupied on Aug. 1. Smuts now endeavored to entrap the Germans in the Nguri Mountains, 80 m. w. of this port. Failing this, he defeated them after a three-days' struggle (Aug. 9-11) at Matamonda, whence they were forced to retire toward Mrogoro. Van Deventer, in the meantime, had again come off victorious near Mpwapwa (Aug. 11), and by Aug. 21 engaged the Germans at Kilossa on the railway as Smuts was attacking it at Mkata, 20 m. further east. But the enemy escaped just as their two forces were joining hands, following the capture of Bagamoyo on the coast (Aug. 16). The British now pressed on through Mrogoro, taken on Aug. 26, after the fleeing Germans. The capital, Dar-es-Salaam, 'Harbor of Peace,' surrendered on Sept. 4, 1916.

During a corresponding period the colony was being invaded from four other quarters: (1) Rhodesia, by the British; (2) Congo, by the Belgians; (3) Uganda, by the British; and (4) Mozambique, by the Portuguese. On May 25 General Northey and his Rhodesians advanced from the line of the Stevenson Road which connects Lake Nyasa and Lake Tanganyika. His objective was New Iringa, finally occupied on August 29.

Five hundred miles to the north two Belgian columns under General Tombeur advanced on May 18 from either end of Lake Kivu and, spreading out fanwise, eventually served as a right wing to the British troops from Uganda. These, secure in their hold on Bukoba and the

west shore of Lake Victoria Nyanza, were now clearing the eastern coast. The two contingents aimed to overtake Van Deventer's main body with a view to co-operating with him against the Central Railway. The Belgians compelled the retreat of the Germans near Kivu and occupied the Kama range of hills. By June 13 they were 125 m. in the interior. The Allies now controlled the entire north-west. The capture by the British of Mwanza on Lake Victoria Nyanza (July 14) ended all resistance in the north central zone. On Lake Tanganyika the last German gunboat, *Graf von Gotsen*, was sunk by the Belgian, *Netta*, on July 28. Ujiji, the Lake railway terminus, fell to the Belgian right wing late the same month and shortly after Rutshug, some 60 m. to the east, was seized by the left, while a junction with Northey's outposts was effected upon the capture of Karema, a more southerly lake port, on Aug. 18. Tabora, Tombeur's main objective, was taken only after a severe struggle (Sept. 1-11). With the contingent of General Wahle in full retreat, all the west, as well as the north, was now in the hands of the Allies.

The Portuguese, in the meantime, had undertaken to hold the line of the Rovuma River, the boundary almost to Hyasa between the German colony and their own in Mozambique. Their operations began with the occupation of Kionga (April 11), taken from them by Germany in 1894. Their activities thereafter were limited mainly to harassing the German river posts with their gunboats.

There was now a lull on the east front. A half year of forced marches and continuous fighting under an equatorial sun was all that could be demanded of even the hardy South Africans; 12,000 men were sent back and replaced by the King's Rifles and the Nigerian Brigade under General Cunliffe, who had served well in the Kamerun campaign. The next phase of the operations was the attempt of Smuts, Van Deventer, and Northey to encircle the main German force retreating from Mrogoro before it could cross the Rufiji at Ruaha. This involved a long struggle, from November, 1916, into the winter of 1917, on through the summer and fall until on December 1, 1917, Van Deventer was able to announce officially that the complete conquest of German East Africa was effected, that the Allies had wrested from the enemy her last colony with an area of about 384,000 square miles.

On the other hand, Von Lettow-Vorbeck was to remain a thorn in the British side for the duration of the war. During its last year he led the Allies a chase which carried them at one

time as far south as the Zambesi River. As elusive as Villa, his black troops even more savage than the followers of the Mexican, he left devastation in his wake. His formal surrender was made to General Edwards at Abercorn on Nov. 25. The German forces had been reduced to 155 Europeans and 1,168 black soldiers and porters. 'In view of the gallant and prolonged resistance maintained by the German force,' says General Van Deventer, 'I allowed General von Lettow-Vorbeck and his officers to retain their swords. . . . Thus ended a remarkable and in some ways unique campaign. Never before had operations on a large scale, with modern weapons, taken place within a few degrees of the equator.'

The Battle of Jutland.—On May 31, 1916, occurred the first and final great clash between the British and German battle fleets. The *Galatea*, a cruiser of Vice-Admiral Beatty's scouting division, sighted the enemy off the coast of Jutland at 2:20 P.M. (British time), while a seaplane from the *Engadine* (the converted Cunarder *Campania*), established the presence of five German battle cruisers heading north. These, Hipper's squadron, were within deck-sight in about an hour; and, sheering off, were reversing their course so as to draw the British back on the main German fleet under Admiral von Scheer. To prevent what he believed was their flight, Beatty followed, increasing his distance from the main British fleet, whose commander, Admiral Jellicoe, had been advised of the pursuit. After an exchange of fire between the cruisers, beginning at 3:48, British destroyers were thrown forward at 4:15, and succeeded in creating havoc among the enemy's craft of the same type. These hornets now operated against the German cruisers, three of which were badly hit. The British on their side had lost the *Indefatigable*, and the *Queen Mary* went down at about 4:30. By 5:00, threatened by the proximity of Von Scheer, Beatty was compelled to repeat Hipper's stratagem and swing north towards his own main fleet. A scout from the same ran foul of the Germans before six, Jellicoe going into action not long after. In the reformation of his battle-line the *Invincible* and *Defence* were lost together with Vice-Admiral Hood and Rear-Admiral Arbuthnot, and the *Warrior* was fatally damaged. In the meantime, though British marksmanship suffered from indifferent visibility due to Jellicoe's position, it had accounted for the *Wiesbaden* and the *Lutzw*, compelling Hipper's trans-shipment to the *Moltke*. The action between the ships of the line became desultory as night fell; but some time be-

fore nine the *Black Prince* foundered. A heavy mist had risen and general operations were now suspended, while three British destroyer flotillas attacked and with success, sinking or leading to the scuttling of the cruisers *Frauenlob* and *Elbing* and the battleship *Pommern*. No counter-strokes were attempted by the Germans.

been scored by Great Britain, but the British fleet retained command of the surface of the oceans. See JUTLAND BANK, BATTLE OF.

The Navies (1916).—Apart from the great engagement of Jutland, nothing of special moment occurred to relieve, for Great Britain, the drudgery of unrelenting patrol duty from the waters of Norway to somewhere south. The



Courtesy of the Independent.

The Greatest Naval Engagement of the War, occurred on May 31, 1916 in the North Sea, between British and German Navies, the latter being forced to the shelter of their base.

Jellicoe had disposed his fleet with a view to blocking any German retirement; but Von Scheer managed to slip away in the night haze. Dawn disclosed no vestige of a German. Jellicoe scoured the sea until eleven when, 'reluctantly compelled to the conclusion that the High Sea Fleet had returned to port,' he made for his home base. No crushing victory had

only excitements were the repelling of occasional raids against English seaport towns. The navies of the other Allied forces performed no signal feats though they co-operated actively with the British; France and Italy in the Mediterranean and Adriatic; Russia, on her own, in the Black Sea.

Submarine Warfare (1916).—As we have

seen, the submarine warfare of 1914-15 had strained relations between America and Germany. By March 31, 1916, 27 Allied ships with 30 lives, and 13 neutrals with 4, had been accounted for. By April 30 the toll registered 96 merchantmen of both classes with 155 lives, 26 of them neutrals. Upon the rather threatening protest of the United States (April 18), Germany agreed on May 5 to be guided thereafter by the laws of humanity. Ships would no longer be sunk without warning unless—the provisos were not easy of fulfillment. Then, on Nov. 19, the British Admiralty reported that since Germany had given her pledge 22 British vessels had been torpedoed without warning. During this period Germany was augmenting her undersea flotilla and building still larger and more powerful types. In order to re-establish her trade with the United States she sent over the *Deutschland*, which made two trips and was then trapped by the British and secreted until after the cessation of hostilities. Great Britain was steadily perfecting methods with which to cope with the great menace to her sea-power. She was now endeavoring to catch the U-boats like fish, with nets of steel.

United States Enlists for Freedom.—From the very opening of the war many elements of America had been in sympathy with the Allies, and many of the American leaders demanded resolute action. The torpedoing of the *Lusitania* with her tragic losses, including over a hundred Americans, men, women, and children, occurred on May 7, 1915. There followed a long interchange of notes (May 13-29; June 10-July 10), which reached a deadlock on Nov. 25 and a quasi-settlement on Feb. 15-17, 1916. The scruples of William Jennings Bryan against signing the second *Lusitania* note (June 10, 1915) had led to his resignation, and a somewhat more vigorous policy was initiated under Secretary Lansing. The admission of Dr. Constantine Dumba, Austrian ambassador to the United States, that he had given a letter to James J. F. Archibald, American war correspondent, to be delivered to Vienna, in which he proposed to cripple munitions plants in the United States, led to the recall of Dr. Dumba (Sept. 28), while in December the German naval and military *attachés*, Captains Boy-Ed and Von Papen, became *persona non grata* by reason of pronounced anti-Entente activities. In October the revival of submarine warfare was threatened. To meet it the more pacific leaders of Congress urged the passage of the McLemore resolution, which called for the virtual abandonment of American rights as to travelling the sea. The resolution was

tabled on March 7, 1916; on March 24 the *Sussex*, a British channel steamer, was torpedoed without warning and two more Americans were lost. President Wilson now threatened to sever diplomatic relations (April 18), in reply to which Germany promised (May 5) to use more moderation; but as we have seen there were conditions attached. A further exchange of notes ensued as America's policy of 'watchful waiting' was resumed, but now with thinly veiled impatience. In December, 1916, Germany launched a peace offensive with a note addressed to the Allies. Her overtures were rejected, however, as 'empty and insincere' (Dec. 30). She persisted in her policy of 'frightfulness' both by land and sea, evidently laboring under the impression that it would help to keep the United States out of the war, and that in case of trouble the German-Americans were powerful enough to split the nation.

While President Wilson was expressing before the Senate (Jan. 22, 1917) the principles of what was later to become the League of Nations, Germany announced that from Feb. 1 the larger part of the North Sea and Mediterranean and the Bay of Biscay were barred to shipping.—'All ships met within that zone will be sunk.' One American passenger steamer per week would be permitted to go to England under conditions no free nation could accept. America promptly severed diplomatic relations, recalled her Ambassador, and dismissed the German Ambassador Von Bernstorff. On Feb. 12 Secretary of State Lansing declared to Germany, through the Swiss Minister, that only by the renewal of her pledges of May 5, 1916, was further discussion of the submarine question possible. The sinkings continued, and on Feb. 28 the final bomb was exploded by the publication of a dispatch from the German Foreign Minister Zimmerman to his Minister in Mexico, instructing him to propose an alliance with Mexico and Japan against the United States in which Mexico's bribe was to be Texas, New Mexico, and Arizona. On April 2, 1917, in his address before Congress, President Wilson unhesitatingly urged a declaration of war against 'this natural foe to liberty.' Two days later the Senate seconded the Chief Executive; and on April 6 the House by an overwhelming vote confirmed the resolution that 'a state of war between the United States and the Imperial German Government, which has thus been thrust upon the United States, is hereby formally declared.' Thus did the United States 'enlist for freedom.'

This happened at a time when Russia was torn by internal disorder and the Allies needed

man power badly. Their losses in their victorious drives and Russia's practical withdrawal had caused a deadlock.

America threw herself into the great task immediately and whole-heartedly. Immense appropriations were granted by Congress. The War Department took steps to bring the regular army up to war strength and the National Guard up to 330,000. Preparations were made for floating a great national loan. On April 21 a British commission under Balfour arrived, followed three days later by the French War Commission of which Marshal Joffre was a member. Financial support was at once given to Great Britain, France, and the various Allies. Their economic relief was discussed and armed co-operation both by land and by sea guaranteed. On May 17 the Army Draft Bill was passed, and as it was being signed next day by the President the first contingent of the Army, a unit of the Medical corps, reached England. On June 7 about 10,000,000 men of military age registered for compulsory service under the Selective Draft Law. General Pershing was appointed Commander-in-Chief of the American Expeditionary Forces, arriving in Paris with his staff on June 13. On the plea of the French and British Commissions it had been decided to hearten France by sending at once an American contingent, however small. The first troops, under the command of Major-General Sibert, debarked in France June 26, 1917.

Russia's Collapse and Defection.—At the opening of 1917 the Russian command was on the alert, but through the rank and file was spreading the news that soon there was to be an upheaval through which every private would be as good a man as his general. The previous autumn had reduced Russia to a state of ferment. Brussilov's offensive had recovered a certain amount of her provinces but had won no decision and had wasted human lives. The Imperial Government was first criticized and then suspected of capitalizing the reverses. It was rumored that the court was pro-German, that a shameless peace was being plotted by the Czar. As early as April, 1916, Brussilov had said to a war correspondent: 'In Petrograd they have a switchboard which connects with Berlin.' The Czar's domination by Rasputin, a mystic of low birth, vile breeding, and infamous antecedents, believed to be in German pay, was common talk. Loathed by the Muscovites, Rasputin was assassinated on Dec. 30, 1916. The Duma, backed by the people and the army, was demanding reorganization of the government on

Allied lines. In February, 1917, 100,000 workmen struck in Petrograd and 25,000 in Moscow. On March 12, 1917, the Czar dissolved the Duma, but it refused to obey his ukase. On March 15 Nicholas II. was compelled to abdicate and waive the claims of his son in favor of his own brother Grand Duke Michael, who assumed the title of Regent (see RUSSIA). On the next day the new ruler virtually abdicated, having declared that his authority must rest on the will of the whole people. A new cabinet had already been formed, headed by Prince Lvoff. This provisional government was a coalition representing the three factions responsible for the revolution. Their leaders were Premier Lvoff, of what might be termed the Business Men's and Landowners' League, Milyukoff, of the Civil Reform Movement, and Kerensky of the Soldiers' and Working Men's Committee. The new government recognized the Teutonic menace and declared to the Entente that it would pursue the war energetically and 'hasten the hour of the final triumph of a regenerated Russia and her valiant allies.' This resolution came through Milyukoff, the Foreign Minister. On May 16 he was ousted on the grounds of adhering to an Imperialistic policy expressly renounced by the Cabinet. A Socialist succeeded him, and Kerensky was made Minister of War. He too was against a separate peace, but his association with conservatives allowed the Petrograd Soviet to plead misrepresentation. The Soviet openly favored a separate peace, claiming that the war had been initiated and waged for the benefit of the royal castes and moneyed classes.

Meanwhile, as might be expected, there had been considerable unrest at the front. The troops were being showered with propaganda both from the rear by the Soviets and from across the lines by the German sponsors of Bolshevism. Their growing demoralization is evidenced by the fact that from Feb. 20, 1917, until the end of April they remained on the defensive. On April 28 the political situation seeming to adjust itself, Alexieff became more active along the whole front and on May 5, following Milyukoff's declaration, the artillery bombarded the German lines from Kovel down to Stanislaw. But when it came to the assault, there was a sullen demur. The soldiers asserted that they were free agents; desertion became the order of the day; discipline broke down, reasserting itself only when called upon to repel attacks. Soon there was no reason to do that. The Germans claimed the Russians as brothers, and the two armies were fraternizing in No

Man's Land. The situation was as hopeless as it was absurd.

The Grand Duke Nicholas was a Romanoff and objectionable to the growing power of the radical elements. He was dismissed late in March and replaced by Alexieff, the Chief of Staff. In utter disgust Brussilov now resigned but under pressure resumed his post, rebuked the Soviet delegates for interference, and was now made Commander-in-Chief; the military situation began to improve; and a resumption of the southern offensive was planned. The Russians, led by Kerensky in person, rushed to the assault on an 18-mile front and won the Austro-German first lines (July 1, 1917). After consolidating their gains, they resumed their efforts, extending them south. The offensive then expanded down to the Carpathians (June 8-9). On July 11 the Russians were progressing on a 100-mile front. To the Allied world it looked as if all were going well and Lemberg would be captured once more; but in spite of the example of Kerensky, his soldiers suddenly grew rebellious over what they deemed a needless sacrifice of lives. His appeals were jeered; by the 20th mutiny had spread to a joint where the enemy was let through. Whole regiments laid down their arms. Complete demoralization ensued, and by July 20 Kerensky's forlorn hope had come to an end. Two days later the Russians were giving ground all along the Galicia-Bukowina front some 150 m. The Southern Army was walking home, deserting its guns. In the Caucasus and Persia the situation since the preceding summer had undergone no material change, though in October the Russians had shown some activity west of Trebizond. The winter had been quiet except for raids by local tribesmen. Towards the middle of spring (1917) the offensive was resumed. The advance towards Mesopotamia was in full progress by Mar. 7. Their right crossed the border two days later, and the Turks fell back on Mosul. By April 5 the centre was in Khanekin once more, and General Baratov established contact with General Maude, who was advancing up the Tigris and Diala. Then a curious situation arose. Though the armies of the Caucasus began to draw in their horns, Baratov endeavored to co-operate actively with Maude. Undoubtedly it was his home government rather than the summer heats which forced the Russian general to desist and leave the British in the lurch. The retirement of his expedition began early in July. Meanwhile in Russia the same supine retirement was in progress. On Aug. 2, 1917, Brussilov resigned in favor of Korniloff. There fol-

lowed a certain amount of resistance on the Baltic, but on Aug. 22 the Russians were forced to fall back on the Riga-Dwina front. Before Riga there was some semblance of a struggle, but Lechitsky had a mere handful of loyal troops with which to oppose 260,000 men. The great port fell into Von Bulow's hands on Sept. 3, 1917. The Germans were now 312 m. from Petrograd.

At the very moment of the Galician catastrophe Kerensky had succeeded Prince Lvoff as Premier (July 20). He did his best to steady the army, but his power waned as that of the Bolsheviks waxed. Upon the capture of Riga, Korniloff was deposed by Kerensky for his attempt to stage a reactionary coup d'état: but Kerensky's promise that Russia was to be made a republic in no way satisfied the radicals (Sept. 15). On Oct. 18 the Germans seized Moon Island at the entrance of the Gulf of Riga and bottled up the Russian fleet. The Bolsheviks immediately claimed incompetency on the part of the present cabinet. Backed by the masses of Petrograd, on Nov. 7 they seized the government, and their leaders Lenin and Trotsky became Prime Minister and Foreign Minister. Kerensky escaped, to appear later in London.

The new government demanded an immediate democratic peace and concluded an armistice with the Central Powers at Brest-Litovsk (Dec. 15). The negotiations for peace lasted over two months and were tempestuous owing to Trotsky's demands that it be based on 'no annexations, no indemnities.' The parley was broken off on Feb. 10 and the Germans resumed operations a week later. One of their columns came within 70 miles of Petrograd. This brought Trotsky to terms and the treaty of Brest-Litovsk was signed on March 3, 1918. By it Russia surrendered all claims to Poland and the Baltic provinces, and renounced her rights to Finland and the Ukraine, which she agreed to recognize as independent. To Turkey she gave up Transcaucasia and its oil wells. By this treaty she lost about a half million sq. m., an area almost twice as large as the German Empire. She also permitted herself to be robbed of 30 per cent. of her manufacturing industries, 75 per cent. of her coal and 75 per cent. of her iron. Thus with her relinquishment of the Ukrainian wheat belt, she indirectly supported Germany in the war against her former Allies.

The Third Year on the Western Front.—The opening of 1917 found General Haig, now Marshal, still in supreme authority over the British forces in France, while General Joffre, previously elevated to the same rank, was acting

as head of the Allied Military Council, his command resigned to General Nivelle (Dec. 15, 1916), hero of the recent Verdun offensive. Pétain had apparently been passed over. Such was not the case; he had refused to accept the position unless freer hand were given to its incumbent. Lack of co-ordination between even the French units and certainly more or less friction between the Staffs of Great Britain and France was one of the main handicaps against a successful conclusion; and this was fully recognized by Pétain, the unerring strategist. The military dispositions of Germany, directed by Von Hindenburg, Chief of Staff and virtual director of all the Teutonic forces since September, remained unaltered. The German forces were favored by their unity of command, for the royal leaders were but puppets played upon by Von Hindenburg and Von Ludendorff, the First Quartermaster-General.

The Anglo-French front in the Somme presented the same contours as it did in November. The western campaign of 1916 had ended in a military stalemate. Politically all of Europe was in flux. The German peace proposals of December had been rebuffed but the *régimes*, both civil and military, of all the belligerents, especially the Allies, dared no longer impose their will without national approval. Propaganda had begun to play as important a part as the shell. Though the Irish Rebellion had been put down, Great Britain's authority was being attacked or undermined in other quarters. Her hold on India was none too secure. In England pacifism was raising its head; in France defeatism was being sedulously fostered; in Italy anti-Entente socialism and pro-German capitalism were festering side by side; in Russia Bolshevism was about to break loose. The Allied refusal of the German peace proposals was, therefore, in the truest sense an open letter of self-vindication supported by a reaffirmation of aims and ideals: 'The Allied nations have sustained for thirty months a war they did everything to avoid . . . Once again the Allies declare that no peace is possible so long as they have not secured reparation for violated rights and liberties, the recognition of the principle of nationality and of the free existence of small States.' Summed up as right against might, democracy against autocracy, this became the slogan of every soldier.

It was at this point America entered the scene. Before American troops arrived, however, the British had made spectacular advances along the Western Front, and the German Army had withdrawn to the formidable defense of the Hindenburg line. Further south

the French also pressed the Germans and after the British advance of the Somme the French Sixth Army (Fayolle), with its ever victorious Iron Division, was released for service against the Chemin-des-Dames. That a tremendous offensive was due Von Hindenburg was certain. Prevent it he could not; postpone it he might, and probably hamper its full effectiveness by the counter-strategy he was about to develop. Unquestionably he seemed to have stolen the Allies' thunder when his whole army began to fall back on a line from north of Cambrai to east of Noyon. To the south the movement did not soon cease, the old line having bulged much further west in this quarter. On March 21 the Germans, however, had halted, making what was intended to be a conclusive stand on the Arras-Cambrai-St. Quentin-La Fère line. During their retirement they had systematically devastated an area of over a thousand square miles. Three hundred towns and villages were wiped out. The wrath of France was sharpened. At once her sons pursued their enemy, actually driving them to the cover of their prepared defences. Though all of the railroads had been destroyed, new ones were being laid with remarkable speed. Guns were rushed forward by man-power if other means were lacking. The last stages of the southern retirement of the Germans resembled a flight. Further north raged the Battle of Arras, whose objectives as ever were Lens and Cambrai. The whole German front from St. Quentin to Lens was subjected to a prolonged hurricane fire which gradually intensified. Here, April 9, an attack centering on Vimy Ridge was launched on a 12-mile front. By the fury of this assault the Germans were driven several miles and the famous ridge, long deemed impregnable, was stormed and virtually cleared by the Canadians. On April 12 the Germans were ousted from their last foothold on Vimy Ridge. Persistent pressure against their line was driving the Germans back towards their emergency line running from Drocourt to Quéant. They were already strengthening their positions to the rear of the Hindenburg line, whose value had been decidedly diminished. While the British were scoring these successes in the north, the French launched their own big offensive between Soissons and Rheims (April 16). See AISNE, BATTLES OF; SOISSONS, BATTLE OF.

At the same time pressure was being brought to bear all along the Champagne front east of Rheims. Three days later the offensive was resumed on the Aisne. A tremendous drive was made across the Chemin-des-Dames be-

tween that river and the little Ailette. At this juncture the Crown Prince began throwing his reserves into the conflict. By May 21 all of the Siegfried Line except a section on the Bullecourt ridge was in British hands. There was a lull as the field of major operations suddenly shifted 50 m. to the north.

As a prelude to the Battle of Flanders an attack was delivered (June 7, 1917) on the front between Armentières and Ypres. Its aim was the destruction of the Messines-Wytschaete salient. For fully a year the Anzacs had been busily engaged in mining the ridges under these two villages. The detonation which accompanied the earthquake that destroyed them both (June 7, 3 A.M.) was audible to Lloyd George 140 m. away across the English Channel. It was his answer to any suggestion that Great Britain still lacked high explosives.

Now under Pétain, Commander-in-Chief since May 15, the Allies were preparing to resist, at whatever odds, the crushing counter-offensive which the Crown Prince was known to be about to launch. This assault began on July 19, 1917. It resulted in a tremendous loss of man power for Germany, and vigorous counter attacks in every sector on the part of the Allies followed, to develop into a general Allied offensive.

In the Lens sector, the British had been at work pocketing the city. A vigorous attack on Aug. 15 secured all of the northern defences, including the famous Hill 70, an altar on which thousands of lives had been sacrificed. But the city of Lens was fortified to its very core. Germany had no intention of relinquishing so valuable a property. Coal is one of the sinews of war. Faced with the destruction of the collieries, the Allies were in a dilemma.

Meanwhile the Battle of Flanders was in full swing. It began on July 31 with a Franco-British attack on a 15-mile front from the Lys up to the flooded area opposite Nordschoote. In a single day the French captured the hamlet of Steenstrate and village of Bixschote; and the British, east of the Ypres-Staden Railway, Pilkem, St. Julien, Westhoek, Hollebeke, Basseville, in all ten villages and hamlets. The region was cleared to an average depth of 2 m. and about 5,000 prisoners were taken. On Aug. 15 came the second general assault. The second day found the British in Langemarck. They advanced still further on the Ypres-Menin road (Aug. 22) but lost ground before a counter-attack two days later. Operations were temporarily suspended at the same time as they languished before Lens after a moderate success by the Canadians (Aug. 21-23).

Just before this Pétain had carried off his coup before Verdun and in one day (Aug. 20, 1917) had recovered all of the strongholds between Avocourt and Bezonvaux. By the 26th Hill 304, famous for all time, was at last regained. Some 6,000 prisoners were taken in this drive, which in less than a week won back for France all but a fraction of the territory lost in the major Battle of Verdun.

In other sectors comparative quiet reigned. Near the coast the British were preparing for the third phase of the Battle of Flanders. Haig appeared now to have Ostend and Zeebrugge, the submarine base, as his final goal in this quarter. The immediate objectives were control of the Ypres-Menin road and Passchendaele Ridge. The offensive began on Sept. 20, 1917, on an 8-mile front between the Ypres-Comines Canal and the Ypres-Staden Railway. The tactics employed have been indicated with more or less detail in the Battle of the Somme. A present variation was the increasing use of tanks and the occupation in the attack, as well as the defence, of shell-craters created for that purpose during the final moments of the barrage. By the end of Sept. 20 the British were masters of Veldhoek, of the Glencorse Wood and several others clustering about this point, 'Inverness Copse' among them. The fifth stage of the Allied offensive began on Oct. 4 on a front of 8 miles. It won the main ridge to about a half mile of Broodseynde; but bad weather stopped the operations for a while. The prisoners taken thus far numbered about 10,000. With the French supporting his left, Haig inaugurated a sixth attack (Oct. 9) on a 10-mile front. The British were now within a few hundred yards of the village of Passchendaele, they commanded the plain of Flanders, and were within gun range of Roulers.

The next general attack came on Oct. 12. An advance was made on a 6-mile front, mainly along the Ypres-Roulers road and the railway. The Forest of Houthulst threatened the British left. The French gained a foothold in it and ground to its northwest. Resuming the assault ten days later, the British made progress on the railway, while the French cleared the southern part of the big forest. After a week of intense artillery fire Passchendaele was stormed again on Nov. 6. The Germans were ejected from their positions and driven back to defences half a mile beyond. Operations in this sector now languished. Meanwhile Pétain had been delivering another heavy blow east of Soissons. Unfortunately, the whole plan of the Allied campaign was now

dislocated by the Austro-German attack on Italy. As the first Americans of the Expeditionary Force were receiving their baptism by fire, the German armies, set free by Russia's defection were invading the Venetian Plain. It became imperative to lend assistance with all possible speed lest a situation should arise whereby France would be threatened in the rear and the Mediterranean be opened to Germany. Accordingly Franco-British forces were detached from the Western front, and on Nov. 3, 1917, a British army under Plumer and a French under Fayolle appeared in Italy and prepared to defend the Adige. The Allies realized as never before the need of closer co-operation. In the Italian war zone itself Great Britain, France, and Italy called a conference which named a permanent Inter-Allied Military Committee made to include Generals Wilson, Foch, and Cadorna. It was high time that this step was taken by the Entente. All of its major parties were present, the absent partner, Russia, having on the same day (Nov. 8) been betrayed a second time, on this occasion by Bolshevism.

While the great struggle in Italy occupied the arena, there was a lull on most of the front from Alsace to Flanders, a lull broken on Nov. 20 by a resumption of the British drive south-east of Arras. This series of operations gained the name of the Battle of Cambrai from its objective. Prefaced by an artillery feint on the Flemish front, an attack was launched by Byng's Third Army on a line extending roughly from Queant to Gouzeaucourt, possibly 15 m. No long-drawn-out bombardment gave warning to the enemy this time. The assault seems to have been a genuine surprise. Supported by a large number of tanks with wire-cutting devices, the British were able to advance for two days without serious check. In that brief time they broke through the Hindenburg Line. At the close of the second day their line was shaped something like an inverted U about 30 m. in extent, the centre of it resting on Cantaing, less than three m. from Cambrai. The Germans, meanwhile, launched a counter-offensive (Nov. 29-30). The assault or assaults, rather, were delivered against both ends of the inverted U and threatened, if successful, to hem in the British centre. It was the British turn to be surprised. Byng found himself in awkward straits. It was generally known that the Germans were being reinforced by their old eastern divisions, and there was a strong possibility that he might be bottled up unless he shortened his line. Many fierce German attacks were repelled, but Byng decided to

play safe. A general retirement was made. As the net result of this fortnight's seesaw the British lost more than half of what had promised to be a very substantial and valuable gain. More than 10,000 Germans were taken, but the British themselves lost a large number.

Ten months of almost continuous hard fighting had led to anything but a victorious decision. The combatants faced another winter in the trenches. But the last stages of the 1917 campaign indicated that both belligerents realized that to reach an issue static methods must be abandoned. Between the Alps and the North Sea twisted an opposing series of fortifications whose very sinuosities entangled their creators. It was as if two wrestlers faced each other across a double barrier, both anxious yet afraid to come to grips. The managers of the champions recognized that it was time to come out in the open or call the fight off.

The Battles for Trieste and Venice.—After Cadorna's drive of Nov. 3, 1916, there were no serious clashes on the Italian front; but its mountainous character, for mountainous it was from Switzerland to the sea, gave the Alpini many opportunities for individual feats of daring. The main struggle, however—the eternal battle for Trieste—was waiting for the coming of spring. On May 12, 1917, the Italians began to bombard heavily the Austrian positions from Tolmino to the sea, concentrating their fire (May 14) on the Vodice Ridge and on Monte Cucco (the Kuk), both on the east bank of the Isonzo. These heights were stormed the same day and fought for tooth and nail for several days to come, ending with the surrender of Hill 652 on May 18. Meanwhile the Italians had been pressing forward in the Carso as well, seizing four of its commanding elevations and the coast town of Duino on May 17. By the 19th they had taken over 5,000 prisoners.

The offensive was resumed on May 27. Breaking through from Jamiano to the coast, the Italians cleared the railway to Medeazza and improved upon their efforts to gain its heights, the Hermada. On May 28 they occupied San Giovanni near the mouth of the Timavo. Austria was losing effectives at the rate of almost two thousand a day.

Meanwhile, in anticipation of an offensive-defensive in other regions, Austria had started to attack near the Tonale Pass in the western Tyrol border and at several points on her northern Alpine frontier (May 31). On June 20 a mining operation blew up a mountain spur west of the Ampezzo Valley near Cortina. The Austrians defending this crest were annihilated. A second spur and its garrison received the

same treatment on July 17. Then on the night of August 18, 1917, the great Italian drive was resumed on a front from Medeazza to about 30 m. n., the invaders breaking through the enemy's first line with hardly an exception. The blow was driven home by a still heavier one to the north, where a new bridge-head was established near Anhovo.

This passage of the Isonzo was one of the most spectacular stratagems of the whole war. By a great feat of engineering it was made possible to divert the water of the river every night and to construct footbridges which were hidden during the day by allowing the river to resume its natural course. When, after many weeks, ten of these bridges were ready for use, the Isonzo remained diverted and four pontoon bridges were thrown over as the Austrians were blinded by searchlights. The Italian infantry crossed at once on a 4-mile front from Anhovo to Loga, and by morning had gained a foothold on the northern edge of the Bainsizza. The Austrians suddenly found themselves threatened from the north as well as the south and were forced to make a stubborn running fight to escape the trap. By Aug. 20 they had lost over 10,000 in prisoners and been forced to retire 6 m. at the centre, though still clinging tenaciously to Monte Santo, the key position on their left. This mountain, 2,240 ft. high, was gradually enveloped and its defenders finally surrendered on Aug. 24.

Across the Bainsizza the Italians were threatening to split the Austrian army by a wedge into the Chiapovano Valley. Meanwhile, further south, the Carso holding attack had resulted in important gains against the Hermada heights and along the Vipacco Valley. In five days the Italians had taken, 23,000 prisoners. Steady progress had been maintained on the Bainsizza. By September the Austrians had been driven back 7 1/2 m. on a front of 11 and had lost over forty villages. All this time the fight for Monte San Gabriele had been raging. Several times the Italians gained a foothold on the bare rock of this 1,700-ft. eminence, but the struggle for its possession seasawed from Sept. 4 to Sept. 9. Then, slowly, but surely, its declivities were scaled, and on Sept. 14 its higher crests and finally its peak were wrested from the Austrians. In a little more than three weeks Italy had taken some 28,000 Austrians and put out of action not less than five times as many.

While the offensive was in progress an Austrian War Council under Marshal von Hoetzendorf had been called at Laibach (Sept. 7), with the result that special pressure was

brought to bear against the Italian advance on the Carso. This now came to a standstill. Meanwhile, in Russia the Germans were bringing a supposed Entente ally to terms. Italy was caught napping. Though her Army Intelligence was aware as early as Oct. 18 that a large number of Teutonic divisions had been withdrawn from the front and even advertised the fact that they were to be used against Italy, no adequate steps were taken to meet so great a menace. Then came the crash. The forces found themselves caught by the sudden influx of a Teuton horde. But military lack of vision (one of the findings of the Caporetto Commission) was mostly to blame. The Austro-German armies were under the direction of General von Bulow. With about 300,000 fresh troops, they confronted three Italian armies, two of them depleted, from the Carso to the passes of the Carnic Alps. They prefaced the drive on Oct. 21, 1917, by a severe bombardment on the Plezzo-Tolmino front. On Oct. 24 they broke through at Plezzo, and below Tolmino they crossed the Isonzo. Working up the right bank and down the left they were able to envelop Caporetto and cut off the defenders of the Monte Nero district. Thus in an instant Capello's left centre was in the air, and the Duke of Aosta risked being hemmed in against the coast. The retirement of both armies was as precipitate as it was urgent. The German capture of Monte Matajur on Oct. 26 made it impossible for the Italians of the shattered Second Army to make a stand between there and Ronzina-Auzza (on opposite banks of the Isonzo). The hasty crossing of this river all along the line to the sea was made under heavy fire. The Italian losses were appalling. The invaders were now deploying on the Venetian Plain and taking prisoners by the thousands. The retreat was becoming a rout, and the speed of withdrawal was being handicapped by the rush to the rear of countless refugees.

Meanwhile, the rapid advance of the Austro-Germans was also menacing the Fourth Army on the Carnic front. Its right wing was forced to fall back hurriedly on the western bend of the Tagliamento. The Second Army was in a state of panic, but the Third nearer the coast was putting up a stiff rearguard action. In ten days the Italians had been driven back 75 m. The Austro-Germans claimed 180,000 prisoners. They continued to press on without let-up. The Tagliamento was crossed all along its course (Nov. 5-6) with especial effectiveness at Tolmezzo, where a wide turning movement was in progress. In this several more thousand Italians were trapped. The Fourth Army was

compelled to give up the Cadore positions and others to their immediate west. This forced the Italians to fall back to the Livenza, the invaders in close pursuit. Meanwhile, what was left of the Second and Third Armies was being reorganized behind the Piave, more tenable than the Livenza, which was reached by the enemy on Nov. 7 and crossed the next day. At this juncture Cadorna was succeeded by Gen. Armando Diaz, assisted by Badoglio and Giardino. The British and French arrived on the scene, but were held in reserve while making secure the line of the Adige. The next phase of the conflict began Nov. 11 with the capture of Belluno on the upper Piave and the Vidor bridgehead near the point of its most westerly curve. There the Italians made a desperate stand on the heights of the Valdobbiadene. At the same time the invaders were sweeping down the Sugana Valley and attacking the Sette Comuni ridges from the east. They cleared the Piave down close to Feltre, while on Nov. 13 they forced a passage at Fagare, where it is bridged by the Treviso-Oderzo Railway. This brought them to less than 20 m. from Venice.

Italy's eastern offensive of September had become a defensive facing north. The situation was grave. The art treasures of Venice were being transferred to Rome and the south. On the coast the Italians were being ably supported by their floating batteries; in the mountains it was sheer grit that kept the foe at bay. In spite of the fact that the Piave as a whole still held, the Inter-Allied Military Committee, Cadorna included, entertained little hope that the present line could be maintained. The Brenta behind it offering no special advantages to the defence, the next retirement would have to be to the west bank of the Adige. This meant the abandonment of Verona, Vicenza, Padua, and, worst of all, Venice. The thought of this wrung from all Italy a violent protest. The problem which faced Austria was the control of the heights of the Sette Comuni (often referred to as the Asiago Plateau) on the west and those of the Monte Grappa range on the east. So long as any of their crests remained in Italian hands, the advance along the Brenta between could be enfladed. Against them great pressure was now exerted by Von Hoetzendorf. The odds against the Italians were sometimes five to one, so that, in spite of determined opposition, they had to relinquish Tomba on Nov. 19, Fontana Secoa and Spinoncia on Nov. 22—all three on their extreme right; but the struggle for the Monfenera and Pertica fluctuated. On Dec. 14 the Austrians were working up Col Caprile,

which overlooks the Lorenzo Valley just e. of the Brenta. The Italians had lost in this drive about 28,000 in prisoners, but the enemy casualties ran as high as 150,000.

Meanwhile on Dec. 4 the British and French had been brought forward to cover Vicenza in case the line should break. The Italians were in sore need of relief, so the Anglo-French contingent now took over the eastern Grappa sector and the Upper Piave. Finally on New Year's Eve the French aided by British artillery made a successful assault on Tomba. Further south the Austro-Germans had been expelled on Christmas Eve from their salient on the west bank of the Piave. Back of the Italian front the presence of the French and British was having an inspiring effect. The situation was growing less tense, more hopeful. Venice was to be preserved.

Bagdad and Beyond.—After Lake's failure to relieve Kut-el-Amara, followed by Townshend's surrender in April, 1916, the Mesopotamian forces were reorganized and placed under the direction of General Maude, commander of the right wing. Most of the summer and fall was devoted to the same feats of engineering which were to make feasible the Palestine campaign. Meanwhile, the old British units had been replaced by fresh material, so that by December, when the Tigris had risen sufficiently to insure good transport, everything was ready for a resumption of the offensive. This was aimed not so much at the capture of Kut as at disorganizing the army in its defence and following it up until completely shattered. Only by a thorough beating could British prestige be restored, Mesopotamia and Persia cleared, and the sections of the Bagdad-Aleppo Railway be controlled. This was now the fixed purpose of the General Staff. The world's attention, on the other hand, was focussed on Bagdad.

In December (1916) the Turks still held the positions which had proved impregnable to Lake, namely the labyrinthine defences of Sanna-i-yat on the left bank of the Tigris, a boom across it, then the intrenchments to the Dujailah Redoubt on the right bank. From this point their line made a sharp bend to the southwest and rested on the Hai River (Shatt-el-Hai), which links the Tigris at Kut with the Euphrates at Nasariyeh, about a hundred m. away. Maude's preliminary operations consisted in a successful effort to gain control of the Hai River (Dec. 13-15). Meanwhile, on Jan. 11, General Marshall had begun hammering away at the Hai salient. By a wearing-down process against very determined oppo-

sition, the defences were taken line by line until during the night of Feb. 3 the last Turks were forced to retire, allowing the British to occupy all of the left bank of the Hai the next day.

The succeeding objective was the Dahra Bend of the Tigris. By Feb. 16 the whole Dahra Bend was cleared with a large haul of prisoners. The right bank of the Tigris was now in British hands as far up as the Shumran Bend. Meanwhile, Cobbe had been making steady headway in the Sanna-i-yat sector, having cleared it to the sixth line, though the Turks fought with the courage of desperation. On Feb. 24 the assault was resumed, the sixth line and the succeeding series of defences were captured, and all opposition in this quarter was definitely shattered.

The Turks, like the Germans at Beaumont Hamel, had believed their vast system of works impregnable. They had defended them bravely but the persistence of the Anglo-Indians, not to mention the daring of the British airplanes, had overawed them in the end. They beat a hasty retreat as the British gunboats were reaching Kut. The town was reoccupied and British honor redeemed. By this time Marshall had worked his way up and out of the Shumran peninsula, where he had been held, however, long enough for the main Turkish force to escape. The 25th found him in full pursuit, the fleeing enemy, harassed by the cavalry and shelled by the British gunboats, a maneuver which continued with intermissions, for more than two weeks. Early on March 11 the Bagdad Railway Station was being guarded by British troops. Marshall, on the other bank, was driving all before him, and by dawn of the same day was in possession of the Tel Mohammed Ridge, the city's last defensive position on the left bank. Early that afternoon he entered Bagdad and restored order. Maude's proclamation of the same date called upon the people to follow the example of the natives of Hejaz by throwing off Turkish tyranny, with the suggestion that they 'participate in the management of their own civil affairs.' On March 14 the Turkish rear made its final stand at Mushaidie, about 20 m. n., and was routed. By the 16th the Turks, according to air reports, were scattered far to the north. The balance of the month was consumed working up the Diala, to the headwaters of which the Russians were fast advancing by way of Kermanshah. From Dec. 13, 1916, to March 31, 1917, almost 8,000 Turks were taken and a vast quantity of stores, but the Turkish military power, though disorganized in several of

its units, was still to be reckoned with. General Maude established contact with General Baratov on April 2, 1917. Anticipating this event, a general advance had been under way since March 31, and now that the British right was secured by the Russians on the Diala, on April 12, Maude started clearing the Bagdad Railway, marching astride the river towards Samara, the next important town. Meanwhile the Thirteenth Turkish Corps, which had been retiring before the Russians, became a menace which could not be ignored. A British column engaged it near Deli Abbas and put it to rout, occupying the town on the same day (April 15). The main army of the right, at this juncture, was being held by the Eighteenth Turkish Corps, another border army, which was defeated April 30. The advance on both banks of the Tigris could now be resumed. A vigorous attack, first on the north and then on the south compelled the enemy to withdraw on the morning of April 22. Later on the same day the British caught up with them and inflicted a decisive defeat. During the foregoing phase of the campaign Maude had taken some 3,000 prisoners, but more important still had put out of action two Turkish Corps. The excessive heat of the Mesopotamian summer now caused a lull broken momentarily when it was learned that the Russians contemplated withdrawing from the Diala district. Ramadie was the next objective. Dust storms prevented an immediate attack, however, and when it became possible to attempt an assault, the Turks were found to be heavily reinforced. The reduction of the town had therefore to await a general offensive (Sept. 26). By a cleverly executed turning movement, made possible by the lack of enemy aircraft, the Turkish force was successfully hemmed in (Sept. 28). Ahmed Bey, his staff, and 3,500 men surrendered.

The capture of Ramadie extended the British control of the Euphrates-Tigris basin and commanded the Aleppo caravan route. Undiscouraged by the loss of Russian support, Maude now swung north again and renewed his clearing operations above Samara. The Turks were defeated and compelled to fall back on Mosul, their main base. The Russian collapse now seriously threatened the British on the n. and n.e. and made further advance inadvisable for the present. Maude proved himself a cautious leader as well as an able strategist to the very end of his career. As Jaffa fell to Allenby (see below), he was carried off by cholera (Nov. 18, 1917). General Marshall succeeded to his command on Nov. 24.

General Sir Stanley Maude had achieved the

main objects of a long and arduous campaign, the fruits of which were destined to end Turkish resistance and force the Sublime Porte to sue for peace.

From Egypt into Palestine.—Asia Minor is bisected by the Taurus Mountains running from Trebizond to the Gulf of Alexandretta. Both the first, its Black Sea gate, and Erzerum, the most essential of the eastern gates, were in the hands of the Russians. To Great Britain had been apportioned the task of capturing the Cilician gate, Adana near the Mediterranean. Here the Turks were excavating the tunnels which would link up their three main railway systems. Deeming a direct attack impractical, any landing being subject to a devastating fire from the hills, an approach more unfavorable than that at Gallipoli, the British strategy contemplated a vast turning movement from the south, with the junction at Aleppo its main objective. This meant the conquest of Palestine. For this operation General Allenby was detached from his Army in France. The Sinai Peninsula boasts but three lateral caravan routes, the southern from Suez to Akaba on the gulf of that name, the second from Ismaila to Beersheba, which was the main Turkish base in Palestine, and the northern along the Mediterranean coast from El Kantara to Rafa on the border. The last is 120 m. long, with but seven water-holes. Already in the autumn of 1916 the British had gained control of the two nearest of these and there had been several brushes with Turkish patrols on all three routes. Then on Dec. 21, 1916, came the capture of El Arish, 90 m. e. of the Canal. The British military line could now continue on its plodding way from El Kantara to Rafa and the Syrian Railway, which it was destined to join. No tracks were ever laid under more arduous conditions. This was a campaign in which engineers played a more than ever important part. By them was the Nile piped to Palestine and locomotives permitted to do the heavier transport work which had fallen at first entirely on native porters and camels. The capture of El Arish was followed promptly by a decisive victory over the Turks at Maghdaba on the central route, which led to the complete clearing of the lower peninsula. Then came a lull, caused partly by the disinclination of the Turks to give battle, but mainly by the necessity of establishing ample and secure communications before undertaking major operations. Invasion was under way by the end of February, 1917. Gaza was saved by a heavy fog, which prevented immediate attack and enabled the Turks to prepare for a long siege. Before this town 20,-

000 Turks were repulsed and routed. This battle was followed by a long period of trench warfare in which the Turks offered a stubborn resistance. With the coming of autumn the war of movement was resumed under General Allenby. In the early hours of Oct. 31, 1917, a surprise attack was launched at Beersheba, and by twilight the city and some 1,800 Turks were in British hands. The defeat of the Turkish left and loss of its base led to the complete investment of Gaza, which was the next to fall (Nov. 7). Thus were the British enabled to land troops and supplies at this so-called port and press their campaign more vigorously. By the 15th the British had seized the junction of the Beersheba-Damascus Railway and were on a line extending to just south of Jaffa (the ancient Joppa). This town, the port of Jerusalem, yielded on Nov. 18. The Holy City was being invested with little opposition. By Nov. 24 the British had occupied the site of ancient Mizpah, and three days later were within a few miles west of their objective. In order to save Jerusalem from the rigors of war, a chance was given the Turkish garrison to retire by the Eastern Gate. Upon their evacuation, the ring was closed by columns advancing from Hebron and Bethlehem, and by Dec. 8 the heights had been cleared of their last defenders. The town was surrendered to General Chetwode by its mayor early on Sunday morning, Dec. 9, 1917. Upon Dec. 11 General Allenby entered the Holy City on foot, accompanied by military attachés or civil agents of the Allies. At the Jaffa Gate he was 'received by guards representing England, Scotland, Ireland, Wales, Australia, New Zealand, India, France, and Italy.' Soldiers from all these lands had battled to win back the Holy Sepulcher, and it is hard to say which had fought the most zealously. A proclamation covering conditions of occupation was framed in seven tongues and posted on the Citadel. Thus in all dignity was the final Crusade achieved and its success crowned by making the goal of many pilgrims truly free for the first time in history to the religionists of conflicting creeds. See JERUSALEM.

The Navies (1917).—With America's entry into the war, naval operations, while not undergoing any very radical change, were considerably lightened for the Allies by the cooperation, especially in the North Sea, of America's great fleet of superdreadnoughts and fast cruisers. Of even greater service, if possible, were her numerous flotillas of destroyers, a first squadron of which was in European waters on May 4, 1917. These vessels assisted materially

in keeping within bounds the German undersea menace. Throughout the year there was the usual succession of Allied naval losses, casualties sustained through invisible agents, submarines or mines.

Submarine Warfare (1917).—On Jan. 31, 1917, the German Government threw aside all restraint and declared flatly for unrestricted warfare. The zone was extended to surround Great Britain, Ireland, France, and Italy. On the first day of the new campaign (Feb. 1) 10 ships, 113,000 tons, were sunk. Diplomatic relations with Germany were broken off by the United States two days later.

The cruising radius of the submarines was now materially increased, and their destructiveness to the shipping of the whole world was reaching alarming proportions. As a first step towards neutralizing the situation, President Wilson authorized the U. S. Shipping Board to take over the 87 German-owned ships interned in American ports upon America's entrance into the war (June 30). Already active steps had been taken to supply America with an adequate merchant marine and the Allies with a tonnage which would help to meet their losses. The Emergency Fleet Corporation set promptly to work establishing shipyards; steel ships were soon on the way and security seemed measurably assured. To safeguard these carriers, new devices were entertained for the deception of the enemy. By painting them with bands of variegated colors applied on scientific principles it was found possible to decrease their visibility, and produce illusions of direction which would impair marksmanship (see CAMOUFLAGE). But in spite of all precautions the sinkings continued. The total Allied and neutral losses for the year amounted to over 1,264 ships, totalling 6,371,000 tons.

Aerial Warfare.—The airplane revolutionized military strategy and battle tactics. It replaced the scout and the cavalryman as the 'eyes' of the army. It proved itself to be the safest despatch bearer. A large number of airplane attacks were made by all the belligerents, principally upon military positions, railway centres, and factories producing war material. At the beginning of hostilities there were constant bomb droppings by German air craft upon Paris, Boulogne, and Calais, but these became less frequent for a period as the Allies increased their aerial equipment. Several raids on English towns were made. On Feb. 15 and 16, 1915, the Allies organized two extensive airplane assaults upon the naval base at Zeebrugge, Bruges, Ostend, and other Belgian towns in German possession, and considerable

damage was inflicted. British aviators also dropped bombs upon the Zeppelin works at Friedrichshaven on Lake Constance; but it was not until the middle of 1918 that these were finally destroyed. The French also made successful air expeditions. With the progress of the war, the Allied raids on the bases of the Central Powers increased in frequency and violence. They were expanded as time went on to include centres not necessarily military. This was done as an act of reprisal against the continual aerial attacks on London and Paris. England's casualties in 59 raids amounted in all to 619 civilians killed and 1,650 injured. Many spectacular expeditions were undertaken by individual aviators or squadrons of the Allies. The routine work of such squadrons, on the other hand, was to keep attacking enemy bases and aerodromes. Some 709 raids were carried through by the British Air Force alone, from October, 1917, to the signing of the Armistice. The American flyers established a unit of their own in March, 1918, and shared in the work.

More thrilling than such raids were the battles royal between squadrons. In one of these fought on March 18, 1916, in Upper Alsace, about forty airplanes took part, seven of which were brought down. Again on Oct. 12, 1916, over Obendorf in Germany, over fifty airplanes engaged, of which almost a third were driven to earth. The tactics and evolutions of individual airplanes and squadrons and flying circuses had developed to a point requiring a history of its own. The Immelmann turn, the side-slip, nose-spin, and many tricks of aerial acrobatics became the common property of all experts. A number of types of machines were evolved to meet the requirements of observers, scouts, bombers and duellists; for the air became the scene of personal encounters as well as of mighty tournaments. The winners of the former became heroes. The aviator who brought down five opponents, each feat requiring several witnesses, became known as an Ace (borrowed from the French practice), and the leading Aces were acclaimed as popular idols. Guynemer's record is familiar; Von Richthofen, it is said, shot down some 80 planes; McCudden, 54; the American ace Rickenbacker, in the brief period allowed him at the front, 26.

The Liberty engine was America's chief contribution to aviation. Her aviators brought down 755 enemy planes and lost but 357; for from 1917 the Allies gradually gained command of the air and maintained it till the close. The first flyers in action were members of the famous La Fayette Escadrille which had served

France so well, and which was transferred to the American service in December, 1917. At the close of the war there were 45 American squadrons fighting on the front. America lost 150 of her flyers, coming off easily because her opportunity was brief. The record of France shows that of her pilots and observers 1,914 were killed while 1,451 are among the missing. Zeppelins were used chiefly for raids on defenseless cities, though a time came when, outlined by powerful searchlights and subjected to the fire of anti-aircraft guns, their voyages were made at considerable risk to the crew. Their history is a varied and lurid one. Probably the most spectacular attack on a Zeppelin was that made singlehanded by Lieut. R. A. J. Warneford, the Canadian aviator, on June 7, 1915, near Ghent, Belgium. He successfully bombed her and for his daring received the V. C. Between Jan. 31 and Nov. 21 England alone suffered about 23 Zep' raids. On the whole, the Germans now limited themselves to airplanes for raiding purposes. It has been calculated that for the period of the war there were 51 raids on England.

The German Sea Raiders.—Among the most amazing chapters of the war are the feats of Germany's raiders. Disguised as tramp steamers, their guns hidden by false forecastle heads, they waylaid peaceful and wholly unsuspecting vessels. Throughout the early winter of 1915-16 there had been rumors afloat of the operations of some new type of German craft; and when several merchantmen and the passenger steamer *Appam* from Africa to England became long overdue, it was an open question whether they had been sunk 'without trace' or captured by sea pirates. The latter proved to be the case, for on Feb. 1, 1916, the *Appam* steamed into Hampton Roads, Virginia. On board of her was a prize crew of 22 standing guard over the 429 souls taken from the 8 vessels a still nameless raider had captured and, barring the *Appam*, had sunk between Jan. 10 and Jan. 17. The craft which had done all the mischief was the *Moewe*, a twin-screw steel steamer of about 1,200 tons burden. She was believed to have stolen out of Kiel and slipped through the British Grand Fleet—a correct surmise. During that period she added 26 vessels to her list of victims. Another raider, the *Wolf*, went even further afield in her quest for prey. She was bent primarily on a mine-laying expedition along the coasts of the Indian and Pacific Oceans. The *Wolf* returned safely home after a voyage of fifteen months, bringing

back with her more than 400 prisoners and a large quantity of loot.

The Zeebrugge Raid and Italian Naval Feats.—One of the most intrepid feats in the long history of the British Navy was the raid on the German submarine bases at Zeebrugge and Ostend. Theoretically, it was possible to bottle the entrances of both harbors, as they were only about 200 feet wide, but that of Zeebrugge was protected by an extensive mole and that of Ostend by two long piers. Shore-batteries commanded the approaches of both harbors. On the night of April 22-23 (1918), weather, wind and tide were all favorable and the British naval forces under Vice-Admiral Keyes, commanding at Dover, advanced, hidden by a newly devised smoke-screen. This concealed them until the *Vindictive* (Commander A. F. B. Carpenter) was nosing against the very mole. This obsolete cruiser was gradually swung alongside through the efforts of the *Daffodil*, one of two Mersey ferryboats working with her. The other, the *Iris*, had difficulty in making fast. Meanwhile, the German batteries had been belching fire and it was under their shells and the raking of machine-guns that the blue-jackets and marines made a landing. About twenty-five minutes after her arrival the *Vindictive* was followed in by the *Thetis*, loaded with cement and leading the way for her two sister block-ships, the *Iphigenia* and *Intrepid*. The *Thetis* came to grief but the other two cruisers were sunk at the points selected, so that the main object of sealing the canal was attained. Shortly before this an old British submarine, containing high explosives, had worked her way under the viaduct joining the mole with the mainland. While its daring crew of six were escaping in a skiff, the submarine blew up, and the viaduct and the Germans defending it were no more. The operation lasted hardly more than a half hour. A thousand men volunteered for this expedition, which returned with casualties of 538 men and 50 officers, of which 144 and 16, respectively, had been killed.

At Ostend the block-ships *Sirius* and *Brilliant* were not so successfully placed. The experiment was repeated in this quarter on the night of May 9-10, when the now very much battered *Vindictive*, well filled with concrete, was sunk between the piers and the channel partially blocked. The casualties on this occasion were few.

Italy had already proven the mettle of her navy by the daring exploit of Lieutenant Rizzo on the night of Dec. 9, 1917. On that occasion he ventured into Trieste Harbor with two motor-launches for the purpose of destroying

some Austrian warships. To approach them it was necessary to cut the steel cables which secured the system of nets and mines guarding the entrance to the harbor. The operation involved landing on one of the great piers. Eight cables, three above and five under water, had to be severed. This accomplished, his boats slipped into the Vaplane di Muggia and torpedoed the Austrian predreadnought, the *Wien*, and another ship, the *Budapest*. A second naval exploit of a similar nature was performed on May 14-15, 1918. Rizzo (now Captain) distinguished himself once more on June 10.

The Navies (1918).—By this time many new devices were in general use for the protection of the great steel warships. Towards the end of October the submarines had ceased to be a menace, but the contact mines remained a danger. More substantial gain, however, was brought to the British Grand Fleet on the morning of Nov. 21. Opposite the Firth of Forth, the very chine of Germany's great navy, comprising 9 battleships, 5 battle cruisers, 8 light cruisers, and 30 destroyers, were surrendered to the Allies. In the bleak Orkneys they rode at anchor till June 21, when the larger part of them was sunk, with colors flying, by their German crews. Thus the German Navy won its only big victory, the Battle of Scapa Flow.

Submarine Warfare (1918).—It had become now the general practice for the Allies to assemble their carriers and convoy them across the Atlantic; but no such protection could be adopted by neutral states, and so Germany gradually estranged the South American republics. By this time the navigating charts of the waters around the British Isles were marked off into squares for the swift identification of the position of torpedoed ships or *U*-boats sighted by airplanes or surface craft. Later such observations were supplemented by listening-instruments which could locate an undersea craft to within a fraction of a mile. The point at which one of these sharks was supposed to be received depth bombs discharged by a 'Y' gun, another development of the war. A hit was easily recognized by the oil which must rise to the surface. In these operations the American submarine-chasers were an invaluable asset. Their principal bases were Queenstown, Plymouth, and Corfu.

To further extend her undersea operations, Germany now employed so-called 'mother ships' as fuel bases for a smaller type and sent submarines as far as the Western Atlantic for

the purpose of laying mines along the shores of America. Towards the end of May one of the new cruiser type sank a number of vessels off the New Jersey coast. The sinkings continued off and on through the next three months from the Virginia Capes to Cape Cod. For a short period the port of New York was closed, but ocean traffic was soon resumed under convoy. As a preliminary to Germany's request for peace, her submarines were recalled to their home bases (Oct. 25). All of the sharks that remained were surrendered unconditionally, 20 of them on Nov. 20 and 19 more on the following day.

Exit Bulgaria.—On June 3, 1917, General Ferrero, the Italian commander in Albania, had declared that ancient race independent under the protection of Italy. On July 6, 1918, the Italians began an offensive up the Volyusa, the French on their right working down the Devoli. The so-called German Army was composed almost wholly of Bulgars. General Todorov was in supreme command. Opposed to him were the Italians to just east of Lake Ochrida, 8 French divisions, 4 British, and 17 more supplied by Serbia, Greece, and Italy—all directed by Franchet d'Esperey. On Sept. 14 the attack was made on a front between Lake Doiran and the Vardar. The Bulgars were driven from their first and second positions. The attack was now expanded to Monastir. By the evening of the 17th the defences of the Sokel had been seized; and on Sept. 18 the centre was broken by cavalry and aircraft. The Bulgar army was split by a drive up the Vardar. Prilep was soon entered by French cavalry (Sept. 24), and the Veles barriers were captured by the Serbians.

The Bulgarian armies were now in full retreat and the Eleventh German Army was being cut off by the French under Henrys. Trapped in a blind valley, it was forced to surrender on Sept. 30. Bulgaria had already capitulated the preceding day and signed an armistice at Salonica. On Oct. 4 King Ferdinand abdicated in favor of his son Prince Boris. Ere long the Serbians had recovered the whole of their territory, the keystone of a Greater Serbia.

Adventures in the North.—The final year of the war witnessed the launching of two expeditions. One of Russia's railways ran north from Vologda, whither the American Ambassador and the Allied Legations had removed when Moscow became a city of madness, up to Archangel, the chief port of the White Sea. A second and recent railway extended from Petrograd still further north to Kandalaksha (on the same sea) then on to St. Catherine Har-

bor (Murmansk) on the Arctic side of the Kola Peninsula. The northern port was ice-free and, like Kola just below it, and Archangel, the depot of a vast amount of munitions sent to Russia when she formed part of the Entente. None of these supplies had been paid for. The Allies naturally had no desire to let them fall into the hands of the Bolsheviks. Hence intervention on the part of contingents from Great Britain, France and America. Serbia and Poland are said also to have supplied units. Intervention began on July 15 at Murmansk. The railway was soon occupied as far south as Kem on the White Sea and Archangel was occupied in August. The Allies made several efforts to establish contact with the Whites and Czechoslovaks operating up the eastern Dwina but the Reds were able to block the way.

A problem even more serious confronted the Allies in the Far East. The Trans-Siberian Railway had been the carrier of both European and Japanese munitions. Czech and Slovak prisoners of war had, after their release by the Bolshevik government, seized the arms of the soldiers directed against them and were making a brave showing on the Volga and in Siberia against both German detachments and the Reds. To relieve these Czechoslovaks and other conservative and friendly elements of Russia's fighting forces, an expedition to Vladivostok was inaugurated. On August 15-16 two American regiments from the Philippines landed at Vladivostok. The Japanese had already taken the matter in hand with British and French contingents (Aug. 12). General Graves commanded the American forces, but the supreme authority over this zone was vested in the Japanese General Kikuzo Otani. Ere long the eastern lines of the railways were being operated by American engineers in spite of an attempted *coup d'état* by General Horvst, who sought to keep control of the system.

Exit Turkey.—After the capture of Jerusalem (December, 1917), General Allenby directed all his efforts towards his main objective, the Bagdad Railway. On the 19th of that month the British began their advance on a front extending from the Dead Sea to the coast, with the object of clearing the region to Damascus. By withdrawing some of his forces from the Jordan Valley, Allenby was able to attack the Turkish Seventh and Eighth Armies under General Leman von Sanders, with the odds three to one in his favor. He struck on Sept. 19, and by next day had shattered the Seventh so that it retreated in disorder through the Hills of Samaria. The Eighth Army he

crushed so that it was easily rounded up and forced to surrender. The Fourth and last Army, in the Valley of the Jordan, was driven back by the Arab forces of the King of Hejaz. By Sept. 22, 1918, the British cavalry was in Nazareth. In quick succession they entered Haifa and Acre and Tiberias, overrunning the region to the south and west of the Sea of Galilee. The Camel Corps was off for Damascus, dispersing units of the Fourth Army on the way. Within ten days the Turkish resistance had ended. Damascus was reached on Oct. 2 by the Camel Corps, as its garrison was being pursued by the Australian light cavalry. Following the railway they swiftly occupied Homs, Hamah, then Aleppo, the goal (Oct. 26).

Meanwhile, Marshall in Mesopotamia had found his progress checked by the Turkish Sixth Army strongly entrenched in a position astride the Fatha Gorge. A frontal attack would have been very costly, so by clever strategy the Turks were flanked on the left and forced to abandon their stronghold. The British next occupied Kirkuk, thus menacing their rear. Operations had opened on Oct. 23; within two days the Turks found themselves trapped. On Oct. 28 the British came in contact with the Turkish rearguard south of Kalat Serghat and drove up the Tigris. The Turks tried to break through in force but were repulsed. Without chance of relief or escape, the army was surrendered to General Cassels by Ismail Hakki at dawn, Oct. 30.

As if timed by an agreement between Allenby and Marshall, on that very day Turkey capitulated to the Allies, signing an armistice at Mudros. Not long afterwards Generals Allenby and Franchet d'Esperey were to greet each other at Scutari and gaze triumphantly across the Bosphorus at Constantinople, which they had enveloped by their great campaigns.

Italy's Triumph.—The Austrian Eleventh Army could not check the Italian Fourth in the Monte Grappa region in spite of violent counter-attacks. On Oct. 27 an attack was made on the Austrians facing the upper and middle Piave, making headway in spite of the Austrian Sixth Army's (Schoenberg) most stubborn opposition. On Oct. 29 Schoenberg found his army breaking at the centre under the weight of the attacks. The Italian advance became swift. While the heights of the Asiago fell to their Sixth Army (Montouri), the forces of the Piave were clearing the country to the Livenza, which was crossed by the Tenth Army and the Third as well, both deploying on the Venetian Plain. The Eighth Army was now pushing forward to Belluno while the Twelfth

on its left drove the enemy up the valley of the Piave.

These seeming miracles all occurred in a single day (Oct. 30, 1918); but the enemy was already half broken. Austria had appealed through America for an armistice the day before. As for Italy, Vittorio and Conegliano were liberated and Udine about to be restored. Lord Cavan was now leading his British troops and Italians across the Tagliamento while the democratic 332d American regiment was soon to share the victories of the royal General on his right. On Nov. 2 Tonale Pass had been forced and Krobatin found himself thrown back on the Adige, pinned between the two northern Italian armies. On Nov. 3 he surrendered. Rovereto and Trent were in Italian hands at last, the Trentino was recovered. To the east, cities and countryside were being swiftly liberated; and soon Italy was in Trieste, the dream of her Irredentists realized.

Meanwhile, as the Americans were entering the arsenal at Codroipo following a lively skirmish while forcing the Tagliamento (Nov. 4), Austria accepted the terms of Diaz, her only means of securing the armistice she so earnestly desired. The Austrian Empire ceased to exist.

The Last Battles in France and Flanders.—By Feb. 12, 1918, according to French estimates, the Germans had in their front lines some 112 divisions, their reserves numbering 63—in all about 2,000,000 men. On March 20 the Kaiser announced: 'The prize of victory must not and will not fail us.' The next day was launched the German super-offensive. By this time Russia had made her peace and the total German forces numbered about 5,000,000; the Allied at least half as many again. The Germans, however, were stronger in shock troops and enjoyed the immeasurable advantage of but one Command, still under Von Hindenburg.

The aim of the initial drive was Amiens. Its object was to split the French and British armies, roll the latter back against the coast, swing again on the French and force them to the east while slowly enveloping Paris. It was essential for Germany to strike before the French and British had been reinforced by the United States. Units of Americans were already defending several so-called quiet sectors. The first infantry attack was made on the morning of March 21 against the Cambrai salient from Lagnicourt s.e. to Gauche Wood just below Gouzeaucourt. The latter point had already proved a weak spot in December. The

British were forced to retire and this especially exposed the left flank of the forces operating against St. Quentin. On the second day the Germans assaulted on a wider front from Vimy down to La Fère and captured practically all of the British first line. Holding the French by a curtain covering the rear of their entire front, the enemy continued to hammer at the previous sector, exerting special pressure around La Fère, near which the French and British armies joined. Throughout March 23 the latter were forced back in spite of stubborn opposition to the north, and in swift succession they lost their second and many of their third positions. The Germans advanced fanwise. Forced gradually into the open with thinned and disorganized ranks, the retreat threatened to become a rout. Pressure was expanding the front and the forces covering it became inadequate, so that a gap developed on either flank of Haig's right wing.

Fortunately the very swiftness of the retirement had exhausted the impetus of the German attack. By the time it had been recovered the invaders found themselves opposed on the eight-mile gap to the n. by General Carey and his hastily gathered nondescript following. The thirty-mile gap to the south was defended and finally bridged by Fayolle, recently recalled from Italy. These two men unquestionably saved the day and the Allied cause. The British had already been squeezed out of the Combes salient and all of the Somme villages and woods for which they had battled so hard. The invaders had been clearing the railways, and Amiens was in grave danger of capture. Beginning March 23 Paris was intermittently bombarded by a giant long-range gun which caused some destruction and loss of life but did not inspire the terror hoped for. It was finally located about 74 m. away and put out of action.

At this juncture the Allies, fully awakened to the peril of the situation, endeavored to minimize it by making Ferdinand Foch their Generalissimo. By the last of the month the pressure on Amiens had perceptibly relaxed. Thus ended the contest for France.

Suddenly shifting their attack to the north, the Germans made a drive towards the channel with the object of destroying communications between the Ypres and Arras depots, of separating the British from the Portuguese, and putting the latter out of action. The last they succeeded in doing. On the British sector, Sir Douglas Haig had exhorted the men to renewed effort—'With our backs to the wall, and believing in the justice of our cause, each one of

us must fight to the end.' Meanwhile, the enemy had managed to clear the railway to Meriville. Armentières was so saturated with gas as to be untenable for either side. For a week the battle raged around Nèuve Eglise and Mesines and Wytschaete Ridges. About this time the British began their retirement from the Merckem-Passchendaele salient, for which they had fought for three months in the preceding year. It was imperative to abandon a position so easily flanked. But below here, resistance was stiffening so that the Germans ceased to make progress. In the defence of this sector Americans had participated. Meanwhile on the Amiens sector, another unit of Americans cooperated with the French. The fight fluctuated on this front for a month. There were 2,200 Americans fighting, a small number, but by this time there were over half a million of them in France being trained for the counter-offensive which was to come.

On May 27 Ludendorff, who had taken command of the Germans, shifted his aim and struck a terrific blow. The French were vastly outnumbered and fell back. So swift was their retirement that there was no time to destroy the bridges of the Aisne, which was crossed at once by the invaders. The Vesle was crossed on May 28, and next day Soissons fell. About 400,000 Germans were on the Marne and marching down its valley towards Paris. On May 31 the Germans were within a little more than 40 m. from Paris.

At this juncture the American Second Division, together with elements of the Third and Twenty-eighth, was thrown into line. On June 3 the Germans were pressing w. of the town and progressing all along the line running north. The day following the French and Americans checked them at the lower tip of the salient. This good work was repeated on June 5 and bettered during the next two days, when the American Second Division and the U. S. Marines carried off a substantial counter-stroke in which they took Veully-la-Poterie, Torcy, and Bouresches and held them against the enemy.

On June 9, once more taking advantage of the light of the moon, the Germans launched their fourth offensive. Their advance continued for three days; but they were not only checked but almost completely driven from Belleau Wood (June 11) by American regulars and marines (see BELLEAU WOOD). By June 14 two more heavy blows had won back still more. The Italians had been able to send an army as early as April and the Americans now numbered about 300,000 and were fast being

prepared for the fray. There followed a series of minor counter-offensives on the part of the Allies. They resembled sharp raps on a balloon expanded beyond the point of safety; and such was the German front gradually becoming. These engagements switched rapidly from Ypres down to Rheims; now, at the Lys salient (June 28); now, on that of Château-Thierry (July 1); now, on the Somme (July 4). On July 8 an attack was launched s.w. of Soissons, the next day between Montdidier and the river Oise, then back to the Avre on the 12th. Each of these operations, whether undertaken by the British, French, or Americans, led to moderate gains and captured prisoners. Then came Ludendorff's final attempt to break through. As if spoiling for the chance to crush the Americans, he launched his fifth drive against the front which extended from Château-Thierry up the Marne to beyond Dormans, curving around Rheims to the verge of the Argonne. The extreme right of the French front was held by the American Forty-second Division, the Marne left by the Third and Twenty-eighth. The assault was made on July 15. It was checked by the Americans on both flanks; followed by a swift counter-attack which drove the enemy back across the Marne near Château-Thierry. On July 18 was launched a powerful counter-attack by the French and Americans from Château-Thierry to the Aisne. This stroke won the Second Battle of the Marne. The initiative had passed to Foch. With reserves to fall back upon, he pressed on and on until the balloon burst. In this first big counter-blow eight American divisions took part. Americans now held 100 kilometers on the French front, the British 148.

The great counter-offensive was in full swing. The French and Italians widened the German pocket which threatened Rheims (July 19); by next day the Allies had driven its makers across the Marne. On July 21 the latter were forced to evacuate Château-Thierry and swept back 4 m. by the French and Americans. On August 2 the French were back in Soissons; by the next night practically the whole Aisne-Vesle line to Rheims with more than fifty villages had been won. The Americans gained a foothold in Fismes and forced out the last Germans on August 4. Meanwhile, in the north there had been only minor activities around Albert, Ypres, and Montdidier excepting the capture of the Avre heights by the French (July 23) and an assault by the Australians covering Amiens towards the end of July.

On Aug. 5 the Germans began to withdraw from all three regions. The British followed this up on Aug. 7 by attacking. Rawlinson made swift progress, but the French under Débeney were held up for a spell on the Avre. Once over, they captured Montdidier (Aug. 10), as the British were storming Chipilly Ridge on the Somme and pressing on to Bray. Elements of the American Thirty-third Division took part in the latter action. On the same day the First American Army under Pershing became a fact. The Germans were being driven to the cover of the Hindenburg line. The capture of Mont. St. Quentin next day by the Australians opened the way to Péronne, which was reoccupied on Sept. 1.

Meanwhile, the British had been speeding up their offensive on the Lys salient. The Allied machine was rolling on relentlessly against Cambrai, St. Quentin, La Fère, and Laon. Pursued by the Americans and French, the enemy retreated on a 90-mile front. As the Germans were being driven back in a state of growing confusion, a distinctly American offensive was prepared by General Pershing, who had persuaded Marshal Foch that his combat divisions could undertake a major operation on their own. The point chosen was the St. Mihiel salient, long a thorn in the side of the French. The Germans were driven back on all quarters. Before noon almost half the wedge had been eliminated and the next day units of the First and Twenty-sixth Divisions, operating from opposite sides, met at Vigneulles, thirteen m. from the tip. By the 15th the front ran straight from Fresnes-en-Woëvre to the edge of the German boundary. The storming of the heights of Les Eparges was an especially gallant action which did much to win the day. Ten divisions took part in this operation, which recovered for France more than 150 sq. mi. of her territory. St. Mihiel and a number of villages, 15,000 prisoners, and 100 guns were taken. At this critical moment another smashing blow was delivered by the American army, whose performance at St. Mihiel had convinced Foch of its ability to reach an objective. On Sept. 26 began the great Meuse-Argonne offensive (the Battle of Argonne) whose goal was the Sedan-Mézières Railway, Germany's main line of lateral communication. This battle raged for forty-seven days and in it 1,200,000 Americans were engaged, with casualties which amounted to 10 per cent. of that number. With the French under Gouraud on their left, the Americans swept across the Forges stream, stormed a number of heights and captured on the first

day Varennes and Montfaucon, the old German headquarters, with a number of villages. Advancing down the west bank of the Meuse and astride the Aire, by next day they had broken through the second line of defences and reached the third, the Fölkler line. For the following few days there was violent close-quarter fighting all along the front except near the Meuse. By Oct. 4 the Germans were defending their powerful Kriemhilde line and progress became difficult. The Seventy-seventh Division had been doing remarkable work through the rough Argonne Forest. Gouraud had been advancing steadily towards Vouziers, and was now driving the Germans north of Rheims. (See ARGONNE.)

To the far north King Albert and Plumer had resumed the Battle of Flanders. On Sept. 28 they cleared the treacherous Houthulst Forest and the next day recovered Dixmude, Passchendale, and other villages. The Belgians took Roulers on Sept. 30, as the British recovered Messines Ridge. Sweeping forward on a broad front with the French under Degoutte co-operating, the northern armies rolled back the Germans from the coast. Armentières was reoccupied on Oct. 2. During the same period the St. Quentin-Cambrai line was attacked by Byng and Rawlinson. Between them two American divisions, the Twenty-seventh and Thirtieth, were in close touch with the Australians. Marcoing and Cantaing were regained by Sept. 29, the Americans taking Bellecourt and Nauroy. On Sept. 28 Mangin had captured Fort de Malmaison and was driving the Germans off the Chemin-des-Dames. Laon would soon be untenable. Suddenly the whole western part of the German front seemed to grow thin. The balloon was about to burst. The end was approaching. The Allies now pressed forward. The French took St. Quentin on Oct. 2; a day later Lens and her coal fields were first ruined and then abandoned by the Germans. On Oct. 9 the British occupied Cambrai; the next day Le Câteau; on Oct. 18 both Laon and La Fère were won back by France with hardly a struggle.

In the Argonne, on the other hand, a continuous battle was raging. On Oct. 7, after having been cut off for five days, Major Whittlesey and his 'Lost Battalion' were finally rescued after an indomitable resistance. In the meantime, the extreme right had been receiving a grilling fire from the east bank of the Meuse. It was, therefore, essential to bring up the front on this quarter; and the French General (Claudel), supported by two American divisions, attacked the Austrians on this sector with

striking success. The Germans were retiring fast. Notes had been passing swiftly between their government and that of the United States (Oct. 7-8; Oct. 12-14). Germany was becoming anxious for peace, but played for time and endeavored to evade the Fourteen Points set forth by President Wilson. Meanwhile the Allies continued to advance. In the north, where the Americans of the Thirty-seventh and Ninety-first Divisions had been withdrawn from the Argonne, they were helping to clear Belgium from the coast, while in the east the drive against the enemy's rear was further imperilling his position. Having made a breach in the Freya line, the last German 'Stelling,' on Oct. 24, the Americans began to bombard the Germans' main railway. On Nov. 1 the French on their left freed Neuchâtel and Vouziers. The next day they themselves seized Buzancy. Then, as the French pushed on towards Mézières, they swept down on to Sedan. They were swinging soon towards the Moselle ready to envelop and reduce Metz in case the enemy proved more courageous than Austria, which had followed Turkey's example and signed an armistice on Nov. 3.

On Oct. 27, 1918, Germany declared that she would entertain a peace proposal. On Nov. 9 the German Emperor, William II, abdicated and the Crown Prince renounced his rights.

European War, 1939, started Sept. 1, 1939 with the invasion of Poland by German troops; two days later England and France declared war on Germany. The ostensible cause of the war was the insistence by Dictator Adolph Hitler that the free city of Danzig and the Polish Corridor should be returned to Germany. The Treaty of Versailles had created Poland from portions of Germany and Russia. To provide the new state with an outlet to the sea, the so-called Polish Corridor, between Germany proper and East Prussia, was given to Poland. Danzig, at the Baltic end of the Corridor, the population of which is predominantly German, was made a free city under the control of the League of Nations, giving the Polish state the unrestricted use of a large Baltic harbor. On several occasions in the spring and summer of 1939 Hitler had announced his intention of re-incorporating Danzig in Germany. He also demanded a five-mile-wide right of way across the Corridor, joining Germany with East Prussia. Early in August, 1939, when Hitler became more insistent in his demands, both England and France issued declarations

that they intended to follow to the letter recently-made treaties with Poland, which called upon them to give her armed assistance against German invasion of Polish territory. Late in August the world was startled with the announcement that Soviet Russia and Nazi Germany had signed a mutual non-aggression pact.

The Polish Theater. From East Prussia one German force swept down on Grudziadz. In four days it met another German army sweeping east across the Corridor, cutting the line of the Warsaw-Gdynia railroad. Also from East Prussia went a mechanized column toward Mława and Pultusk. From Breslau an army was launched toward Lodz, Kielce, and Cracow. From Slovakia two spearheads swept north through the Jablonka Pass and over the steep Tatras. Overhead hundreds of German bombing planes hurled death and destruction from the skies over villages, cities, railroads, bridges, highways, and the retreating Polish army. So great was the speed of the motorized German forces and so superior were they in equipment and munitions that within 11 days of the opening of the campaign, almost the entire western half of Poland was isolated. At that time the Polish army was still bravely hanging on to Warsaw and a part of the army was still fighting around Lodz. However, the German forces from the south had met their army from the north, east of Warsaw, and, although their lines had not been strengthened sufficiently to prevent the filtering through of refugees, it was apparent that it was only a question of days before the pocketed Polish armies would be forced to submit under pressure of arms or hunger. In the meantime, while the Germans, with Hitler closely following the army, were moving further toward the east, Russian troops began to mass on the Polish border. On Sept. 17 the Russians crossed the frontier. They swept west and in two days met the advancing Germans. The Germans immediately began to retire and an agreement was reached between the two invading forces as to what parts of the stricken nation each was to hold pending final settlement of a boundary. Russia, whose invasion was only slightly opposed, held approximately 3/5 of Poland, including valuable oil-producing lands. The Germans held the western 2/5 including Warsaw, which, though suffering awful destruction of civilian life and property, did not surrender until Sept. 29. On Sept. 20 Hitler announced that the Polish campaign was ended except for some "mopping up."

On the Western Front the war started slowly. For several years both France and Germany had been constructing respectively their Maginot and Westwall (Siegfried) lines of fortifications. These consisted of great subterranean fortresses with underground lines of communications, buried hangars, giant guns, myriads of concrete pill-boxes, tank barriers, etc. The lines at some places were 15 to 20 miles deep with advance works for observers and machine gunners. Neither line, in the belief of military experts, could be reduced by sudden attack. Weeks or months of artillery pounding would be required to break them. Germany, apparently in the hope that France and Britain would agree to peace, once the Polish invasion was an accomplished fact, made no effort to attack on her western front. In the first weeks of the war French troops began a careful advance into the Saar basin between the Rhine and Moselle rivers. Fighting was between only small detachments. The Germans, because of this advance, evacuated the entire population of several villages and Saarbrücken, center of the Saar coal-producing region. At the conclusion of the Polish campaign Germany began to drive the French back. The French quickly retired back to the boundary and the Germans made no effort to cross it. The entire front was inactive until Dec. 1. Germany had massed millions of troops back of the front, many of them near the Belgian and Netherlands frontiers. From Oct. 1 on there was great fear in those two nations that the German attack on France might go through their lands so as to flank the Maginot line. Both nations, therefore, were fully mobilized and were prepared to open sea dikes and river levees to flood their lowlands in event of invasion.

The War in the Air. In the first 3 months of the war German fliers bombed Polish cities, towns and fleeing non-belligerents. In 1940 German armies, covered by air umbrellas and using invasion paratroops, swept across western Europe and into North Africa, captured Crete, secured control of the Balkans and the Scandinavian countries (except Sweden), extended air and naval warfare in the Battle of Britain, and began an offensive against Russia. In 1942, the war having assumed global proportions, the air power of the Allies grew, inflicting great damage to German industrial centers. In 1943 air initiative passed to the Allies and Germany was on the defensive.

The War at Sea. The war, quiet on the Western Front at first, raged furiously at sea. The Allies, determined on depriving

Germany of needed imports, imposed a blockade, naming as contraband, practically everything needed by a nation in peace- or wartime. Ships of neutrals, bound for any nation in Europe, were searched to make certain nothing would find its way into Germany through neutral neighbors. Germany retaliated with an aggressive submarine war sinking many British and neutral cargo and passenger ships in the first weeks of the war, causing loss of hundreds of non-combatant lives, including women and children. Furthermore two German speedy pocket battleships were known to be on the high seas attacking merchant shipping. German submarines sank two major English fighting ships, the H.M.S. *Courageous*, 22,500-ton aircraft carrier and the battleship, H.M.S. *Royal Oak*. However, German shipping had been practically swept from the seas. The German merchant marine was either in home ports or floating safely in neutral harbors. The Allies appeared to have conquered the submarine menace by mid-November when the Germans presented a new weapon, a magnetic mine, which caused havoc with shipping. In retaliation, England announced that her blockade would also apply to all German exports. This step was taken to prevent Germany from selling goods abroad in return for foreign credits. In 1942 Germany's submarine 'wolf pack' sank more tonnage than the Allies built, and in the first three months of 1943 the loss of allied ships was still heavy. But the introduction of the convoy system, an extended land-based air cover, the bombing of Germany's U-boat construction centres, and new and improved anti-submarine devices caused a turn in favor of the Allies in the Battle of the Atlantic after March 1943. An event which, it is said, revolutionized naval warfare was the Battle of the Coral Sea in the Pacific. This battle, in which the Japanese were defeated by U. S. forces, was the first naval battle fought in the air.

A Global War. On Dec. 8, 1941, after the Japanese attack on Anglo-American bases in the Pacific, the U. S. declared war on Japan, and Dec. 11 on Germany and Italy. Thus the European War became a global war—World War II. On Jan. 1, 1942, a joint declaration, pledging coöperative war effort and reaffirming the Atlantic Charter, drawn up by President Roosevelt and Prime Minister Churchill, was signed at Washington by 26 United Nations. With that act the war became, as President Roosevelt called it, a war for survival—the survival of the whole democratic way of

life, and hence a war dedicated to bringing about the downfall of Hitler's totalitarian 'fortress' of Europe.

United States Command in Europe. The U. S. government, June 25, 1942, placed in the hands of Maj. Gen. Dwight D. Eisenhower U. S. command in Europe. The official communique stated:

'The War Department today announced the formal establishment of a European theater of operations for United States forces. Maj. Gen. Dwight D. Eisenhower, formerly assistant chief of staff in charge of operations division, War Department General Staff, has been designated as commanding general, European theater, with headquarters in London, England.'

A Second Front in Europe. In 1942 the U. S. signed mutual-aid agreements with England and Russia and reached full understanding with them with regard to creating a second front in Europe. By mid-1943 Germany was on the defensive and the second front in Europe imminent. Later in the year the Allies overcame Italian resistance in Sicily and moved from there to the Mainland. For a detailed account, see **WORLD WAR II**.

Eurotas, or **Iri** river, a river in S. Greece on which stood ancient Sparta.

Euryale, one of the Gorgons, daughter of Phorkys and Keto, and sister of Stheno and Medusa. With Stheno she attempted to take revenge on Hercules for the death of Medusa, the only one of the sisters who was not immortal. See **GORGONES**.

Euryale, a genus of the water lily family (*Nymphaeaceae*), of which there is only one species (*Euryale ferox*), sometimes called *Gorgon Plant*, found in China and Southeastern Asia. The leaves are circular, very large, and prickly; the flowers are small and purple; and the prickly fruit, which is about the size of a small orange, contains seeds used by the Hindus and Chinese for food.

Eurybiades, Spartan commander of the allied Greek naval forces against the Persians in the Battle of Salamis, in 480 B.C.

Eurydice. (1.) In Greek mythology, a nymph who married Orpheus. After her death Orpheus induced Pluto to restore her to life, on condition that he should not look back at her until they reached the upper world. In his anxiety to see if she were following, he looked back just as they were reaching the upper air, and so lost her.

(2.) An Illyrian princess, mother of Philip of Macedon.

(3.) Granddaughter of Philip of Macedon,

who was the centre of many political intrigues about the succession of the throne after the death of Alexander the Great.

Eurylochus, one of the companions of Odysseus in his wanderings. He was the only one who escaped from the house of Circe, the others being turned into swine.

Eurymachus. (1.) Son of Leontiades, Theban commander at Thermopylae, who deserted with his men to the Persians. (2.) Son of Polybus, one of the boldest suitors of Penelope. He was killed by Odysseus on his return from his wanderings.

Eurynome, in ancient mythology, one of the Titans, who with Ophion ruled over Olympus until they were dethroned by Zeus. She was the daughter of Oceanus, and the mother, by Zeus, of the Graces.

Eurypylos. (1.) The son of Eusemon, and one of the suitors of Helen. (2.) The son of Telephos and Astyoche, sister of Priam, a Trojan warrior who distinguished himself in combat with Neoptolemus. (3.) King of Cos, son of Poseidon and Astypalaea. He was slain by Hercules, assisted by Zeus.

Eusebius of Caesarea (c. 264-430), the 'Father' of church history, was born in Palestine, and passed his youth mainly in Caesarea. He eventually gained the favor of the Emperor Constantine, and became bishop of Caesarea (c. 313). He played a prominent part in the Council of Nicæa, acting as confidential adviser and amanuensis to the emperor; and he was the leader of the so-called semi-Arian or moderate party. Eusebius has the reputation of being the most learned father of the Church, after Origen and Jerome. His *Chronicon*, a history of the world down to 328 A.D., contains extracts from many writers whose works are no longer extant. His most important work is the *Ecclesiastical History*, in ten books (to A.D. 324), the great source for the period covered.

Eusebius of Emesa (d. 360), a learned ecclesiastic of the school of Antioch, was born at Edessa in Mesopotamia, and studied under Eusebius of Caesarea. His inclinations were Arian or semi-Arian. He was twice driven away by his flock, who accused him of sorcery on account of his astronomical studies. He was the adviser of the Emperor Constantius and the teacher of Diodorus of Antioch.

Eusebius of Nicomedia (d. 342) was a relative of the Emperor Julian, and superintended his earlier education. He was the leader of the extreme Arian party at the Council of Nicæa.

Eustachian Tube, a narrow tube, lined with mucous membrane and connecting the pharynx with the middle ear. It is liable to be closed by

catarrh, and its closure is soon followed by deafness of the affected ear. See **EAR**.

Eustachian Valve, one of the valves of the heart, lying at the point where the inferior vena cava empties itself into the right auricle. See **HEART**.

Eustachio, Bartolommeo (d. 1574), Italian anatomist, was physician-in-ordinary to the popes, and professor of medicine in Rome. The tube in the auditory apparatus and the rudimentary valve in the heart which are called after him were carefully described in his *Opuscula Anatomica*, 1564. His *Tabula Anatomica* contains a series of highly meritorious drawings from his own pencil.

Eustathius, (d. c. 1194), archbishop of Thessalonica from about 1166, was born in Constantinople. He was considered the most learned man of his time. His writings were principally on theological subjects; but his *Commentary on the Iliad and Odyssey of Homer* is valued highly.

Eutaw Springs, Battle of, the last pitched battle of the American Revolution, was fought on Sept. 8, 1781, by about 2,000 Americans under Gen. Nathanael Greene, against 2,300 British under Col. Alexander Stuart, commandant at Charleston. The Americans lost, in killed and wounded, 408—Col. Wm. Washington being wounded and captured; the British lost 693. See **REVOLUTION, AMERICAN**.

Eutectic. If a fused mixture of two minerals be cooled down, one of the components will begin to crystallize, provided the two components are independent or do not form mixed crystals. On further cooling a residue is at last left, in which the two components are present in definite proportions. Such a mixture has the lowest melting point of any which can be formed from these minerals, and was called a *eutectic mixture* by Guthrie, a Scottish physicist. Eutectic mixtures play an important part in the constitution of alloys.

Euterpe, ('she who delights'), one of the nine muses in ancient mythology. She was the muse of lyric poetry, and is represented with a flute in her hand.

Euterpe, a genus of tall, slender, tropical spineless palms, chiefly natives of tropical America. They produce a small white flower followed by purple pealike fruit.

Euthanasia, an easy death, or a painless method of putting to death. The use of narcotics or other means for shortening life in disease has recently become a subject of discussion in modern civilized countries.

Eutheria, the highest class of mammals, including those in which there is a well-developed

allantoic placenta connecting the mother and the unborn young. Among the Eutheria are included practically all the familiar mammals.

Eutyches, archimandrite of a monastery at Constantinople, from whom the Eutychian controversy of the fifth century A.D. took its origin and name. In direct opposition to the Nestorians, Eutyches maintained that in Christ there was but one nature, the divine, and that even His body was essentially different from the human. Eutyches was subsequently banished. The Eutychian sect was from 452 put down by penal laws.

Euxenite, a brownish black, lustrous mineral, found in Norway, composed of the rare elements niobium, titanium, yttrium, erbium, cerium, and uranium.

Euxine, the ancient name of the Black Sea, which is usually supposed to be a euphemism for *Axeinos*, 'inhospitable,' because of its stormy and treacherous character. See **BLACK SEA**.

Evagorus, king of Salamis, in Cyprus, from about 410 to 374 B.C.

Evander, son of Hermes by an Arcadian nymph, called in Roman traditions Carmenta or Tiburtis. About sixty years before the Trojan War he is said to have led a Pelasgian colony from Pallantium, in Arcadia, to Italy, and to have built a town near the foot of the Palatine Hill, naming it Pallantium, after the one in Arcadia. Later it was incorporated with Rome.

Evangelical, in its etymological import signifies accord with the doctrine and spirit of the gospel. In the United States it is used to distinguish the more orthodox sects from those of liberal or rationalistic tendencies.

Evangelical Alliance, an association of Christians of different countries and denominations, founded in 1846, which aims at maintaining religious liberty throughout the world, relieving the persecuted in all lands, manifesting the unity of believers, and upholding the evangelical faith. It originated in a conference of English and Scottish ministers in Liverpool in 1845. The Evangelical Alliance of the United States was founded in 1867, and acts in concert with the British organization. *Evangelical Christendom*, a monthly organ of the Alliance, was published from 1847 to 1899, and continued as the *Monthly Intelligencer*.

Evangelical Association, a religious denomination founded among the descendants of German immigrants in Eastern Pennsylvania, in 1800, by Jacob Albrecht or Albright, a Methodist Episcopal preacher. In 1803 the church was organized under its present name, and the first conference was held in 1807 under

a constitution similar to that of the Methodist Episcopal Church. The official organ is *The Evangelical Messenger*, published in Cleveland, O.

Consult *Jacob Albright and his Colaborers; Yeakel's History of the Evangelical Association.*

Evangelical Church. See **German Evangelical Protestant Church; German Evangelical Synod of North America.**

Evangelical Continental Society, founded in 1845, was originally a branch of the London Missionary Society, but has long had a separate organization. It is the only Congregational society on the Continent; its object being to aid existing evangelical churches.

Evangelical Union, The, a religious body formed in Scotland in 1843 by the Rev. James Morison of Kilmarnock, his father, and others, who separated from the United Secession Church. They were joined by ministers expelled from the Congregational Union for similar views—belief in the universality of salvation without distinction, exception, or respect of persons, and in the freedom of the human will. In 1896 the Union was incorporated with the Congregational Union of Scotland. Consult the *Doctrinal Declaration of the Union; Ferguson's History of the Evangelical Union.*

Evangelist, the name given in the New Testament to an official of the Christian Church who seems to have stood midway between the apostles and the pastors and teachers. The function of the evangelist seems in the main to have been that of an itinerant missionary. In this sense, however, the official name seems soon to have fallen into disuse, being transferred to the writers of the four Gospels.

Evans, Edward Ratcliffe Garth Russell (1881-), British explorer, entered the British navy in 1897. He served on the relief ship to the *Discovery* expedition (1902-4), was second in command to Captain Scott in the Antarctic Expedition (1909-13), and succeeded to the command on Scott's death (1912).

Evans, Oliver (1755-1819), American inventor, sometimes styled the 'Watt of America,' was born in Newport, Del. He was apprenticed to the wheelwright trade, and early displayed the inventive genius to which were due the automatic flour mill, the first high-pressure steam engine, a machine for making card teeth, the first steam dredge, a boiler known as the 'Cornish boiler,' and an engine for the propulsion of river boats. Consult *Thurston's Growth of the Steam Engine.*

Evans, Robley Dunglison (1846-1912), American naval officer, was born in Floyd co., Va. In 1881 he was equipment officer at the

Washington Navy Yard, and a member of the First Advisory Board, which laid the foundations of the new steel navy. In the Spanish-American War Evans commanded the *Iowa*, and took a conspicuous part in the naval battle of Santiago (July 3, 1898). He commanded the fleet of sixteen American battleships that travelled around the world in 1907-08, from the time it left Hampton Roads until it reached San Francisco. He was retired on Aug. 18, 1908, and became an advisory member of the General Board of the Navy. He published *A Sailor's Log* (1901); *An Admiral's Log* (1910).

Evanston, city, Illinois, Cook co., on the shore of Lake Michigan. Educational institutions include Northwestern University, Evanston College for Women (1871), Garrett Biblical Institute, National Elementary Kindergarten College. Evanston is the national and international headquarters of the Women's Christian Temperance Union; p. 65,389.

Evanville, city Indiana, county seat of Vanderburg co., on the Ohio River. It is the largest manufacturer of baby foods in the world. It is a center of the soft-coal trade, having five mines within the city limits, and 52 within a radius of 50 m. More soft winter wheat is grown here than anywhere else; p. 97,062.

Evaporation, the change of a liquid into gaseous form (vapor), without chemical change. The process absorbs heat, is an endothermic action. The heat which is absorbed or which disappears in evaporation, measured in heat units per pound, is the latent heat of vaporization. For water at atmospheric pressure it is about 970 British thermal units—the heat consumed in converting a pound of water into vapor without change of temperature would raise 970 lbs. of water one degree in temperature. Evaporation is most commonly induced by heating, as in steam boilers, but it also goes on without heating (evaporation from rivers and lakes, etc.). Most solids (except those which decompose on heating) melt before vaporizing, and the subsequent vaporization is that of a liquid. Solids whose melting point is above their vaporization point change to vapor without melting when heated at atmospheric pressure; this kind of evaporation is called sublimation.

When evaporation proceeds without artificial heating, the heat absorbed is drawn from surrounding objects. Thus, evaporation is a cooling process, and it is often utilized for this effect—in sprinkling during hot weather; in spray-cooling of air in ventilation systems; in cooling-towers and cooling-ponds for reducing

the temperature of condenser water in steam plants; and in making artificial ice.

BOILING POINTS AND LATENT HEATS
OF VAPORIZATION (KENT).*

Liquid	B.P., F.°	Latent Heat
Sulphur.....	833
Mercury.....	676
Sulphuric acid.....	590
Nitric acid.....	248
Saturated brine.....	226
Water.....	212	†970
Alcohol (ethyl).....	173	†378
Chloroform.....	142
Carbon bisulphide.....	118	†156
Ether.....	95	†163
Sulphur dioxide.....	14	†169
Ammonia.....	-27	†570
Carbon dioxide.....	-110

*All figures are for atmospheric pressure.
†B.T.U. per lb.

Evaporation is employed in the laboratory to separate dissolved solids from the liquids which contain them, either as simple evaporation or as distillation. The largest industrial use of evaporation by artificial heat is in steam generation for power production or heating purposes. Water is heated in a strong closed vessel, the boiler, and after ebullition begins, the pressure in the vessel rises, because of the accumulation of steam, up to the limit set by the safety valve. The steam temperature is equal to the boiling point corresponding to the steam pressure.

For distilling water to purify it for drinking purposes at sea, and for concentrating liquids containing dissolved substances as sugar, the efficiency of the fuel which heats the liquid is increased by using the vapor produced in one vessel to heat a second evaporator, the vapor of this one heating a third, and so on.

TEMPERATURE AND PRESSURE OF STEAM
(Boiling point of water at various pressures.
After Marks and Davis.)

Vacuum or pressure.	Temp.	Latent Heat.*
Vacuum of 28 ins. mercury	100° F.	1036
1 lb. per sq. in. absolute	101.8	1035
2 " "	126.1	1021
5 " "	162.3	1000
10 " "	193.2	982
14.7 abs.=0 gage	212	970
3 lbs. per sq. in. gage	221.4	964.3
(Above Atmosphere)		
10° " "	240.1°	952.0

30	"	"	274.5	928.2
50	"	"	298.0	911.0
75	"	"	320.3	893.9
100	"	"	338.0	879.8
125	"	"	353.1	867.6
150	"	"	366.0	856.8
175	"	"	377.6	846.9
200	"	"	388.0	838.0

*B.T.U. per lb.

FACTORS OF EVAPORATION.

Feed-Water

Tempera-

ture

STEAM PRESSURE

	100 lbs.*	150 lbs.*	200 lbs.*
40° F.	1.217	1.223	1.226
80°	1.176	1.182	1.186
120°	1.134	1.141	1.145
160°	1.093	1.099	1.104
200°	1.052	1.058	1.063

*Per square inch above atmospheric pressure.

Evaporation without boiling is an extremely common physical action, being met constantly in daily life, in drying wet clothes. Evaporation from the skin and from the lung tissues into the air breathed has close relation to the life of the human organism. In sweating, the skin is supplied with moisture at an abnormal rate, and more rapid evaporation results, with increased cooling effect. Exposed woodwork absorbs water from the atmosphere, swells, or loses water by evaporation, shrinks, as the moisture content of the air is greater or less than normal. In general, natural evaporation into the open air depends on temperature, humidity of the air, and nature of the exposed surface. Evaporation from the earth's surface supplies the atmospheric water, and thus is the source of rainfall. That proceeding at the surface of bodies of water, lakes, rivers, the sea, is largest in amount, but the ground and vegetation contribute materially to the total.

MONTHLY EVAPORATION (PER CENT
OF ANNUAL)

(Average of four stations in U. S.)

January.....	2.5
February.....	2.8
March.....	6.1
April.....	8.5
May.....	12.0
June.....	13.8
July.....	15.5
August.....	13.6
September.....	10.9
October.....	7.5
November.....	3.8
December.....	3.0

The annual evaporation in the United States varies from minimum values of 18 to 20 inches to maxima well above 100 inches depth of water. It is greatest in arid regions; increases with the proportion of exposed water surface in the district, and increases with the mean temperature. In the Salton Sink, California, evaporations up to 160 inches annual have been measured. See *Badger Heat Transfer and Evaporation* (1926); Webre and Robinson *Evaporation* (1926).

MEASURED EVAPORATIONS FROM WATER SURFACES

(Observations by U. S. Weather Bureau.)

PLACE	Annul. Evap., Depth in ins.
Boston, Mass.	39.1
New York, N. Y.	39.6
Laramie, Wyo.	46.3
Fort Collins, Colo.	59.5
Fort Bliss, Tex.	82.6
Fort Douglas, Utah.	42.5
Tucson, Ariz.	75.8
Clear Lake, Calif.	32.4
Sweetwater Reservoir, Calif.	57.5

Evaporimeter, an instrument for measuring the rate of natural evaporation, used in meteorological observation.

Evarts, William Maxwell (1818-1901), American lawyer, statesman, and orator, the son of Jeremiah Evarts, missionary editor, was born in Boston, Mass. His career as a lawyer was one of exceptional brilliance, and he eventually became a leader of the American bar. For many years he was the head of the famous law firm of Evarts, Choate & Beaman. Among the celebrated cases in which he was counsel were the Lemmon Slave Case, the Parrish Will Case, the Gardner Will Case, and the Tilton-Beecher Case, in which he was the chief counsel of Henry Ward Beecher. He was also President Andrew Johnson's leading counsel in the impeachment trial before the Senate (1868); was the leading counsel for the United States before the Arbitration Tribunal at Geneva, assembled to pass on the *Alabama* Claims (1872); and before the Electoral Commission (1877) argued with great ability in favor of Hayes.

Eve. See **Adam and Eve**.

Evection, the greatest lunar inequality, due to an alternate increase and diminution of the eccentricity of the moon's orbit according to the position of the perigee with respect to the sun. See **MOON**.

Evelyn, John (1620-1706), English diarist,

was born in Wotton, Surrey. He wrote *Sylva, or a Discourse of Forest Trees* (1664), *Terra, a Discourse of the Earth* (1675), and a number of other works on a variety of subjects, but is remembered chiefly for his *Diary*, first published in 1818-19, which shows the graver side of the Royalist party with admirable force.

Evening Primrose. See **Oenothera**.

Evening Schools, schools provided for those who, for various reasons, are prevented from attending the ordinary day schools. These schools are either public or private, and in general are of three types: those giving a repetition of the regular primary and secondary day school instruction; those giving vocational instruction along industrial and commercial lines; cultural schools for those whose daily work offers little opportunity along such lines. In the United States there are various agencies conducting evening schools, important among which are such private and semi-private institutions as Pratt institute and Cooper Union in New York City; Drexel institute in Philadelphia; the Y. M. C. A., Y. W. C. A., and the Mechanics' institutes. The first free evening schools were established for Negroes by the Society for the Propagation of the Gospel. In 1836 a free evening school was opened in Boston in the Warner Street Chapel. The first evening high school in the United States conducted by public school authority was opened in Cincinnati, O., in 1856; ten years later the first public evening high school in New York City was opened. See also **EDUCATION**; **VOCATIONAL EDUCATION**. Consult Sadler's *Continuation Schools in England and Elsewhere*; *Journal of Proceedings and Addresses of the National Education Association*.

Everest, Mount, or **Chomo-Kandar**, a peak in the Himalaya Mountains on the frontiers of Nepal and Tibet. It is the highest known peak in the world, its altitude as determined by trigonometrical measurements being 29,141 ft. It was named for Sir George Everest, who first located it and measured its altitude.

Everett, Edward (1794-1865), American orator, political leader, and educator, was born in Dorchester, Mass., younger brother of A. H. Everett. He gained a wide reputation as a pulpit orator and as a controversialist, his book *Defence of Christianity* (1814) attracting particular attention. While professor of Greek at Harvard he introduced to some extent German educational methods—a significant fact in American educational history. He was governor of Massachusetts in 1836-40, and as such was instrumental in establishing the State

Board of Education. From 1841-5 he was U. S. Minister to Great Britain, at a time when relations between the two countries were strained owing to the McLeod Case, the *Creole* Affair, and the Oregon question. From 1846-9 he was president of Harvard College. Everett's greatest reputation was as an orator. He spoke on numerous public occasions, his best known orations probably being the one on 'Washington' and his Gettysburg Oration, delivered Nov. 15, 1863, at the dedication of the Gettysburg National Cemetery. His orations were published in four volumes (1850-9). Consult *Memorial of Edward Everett*; Dana's *Address upon the Life of Edward Everett*.

Everglades, The, a great marsh, about 90 by 50 m., in the southern part of the Florida peninsula. Its eastern margin is within 5 to 10 m. of the Atlantic Coast; its western edge is 50 to 60 m. from the Gulf Coast. It embraces about 4,000 sq. m.; its surface is 10 to 20 ft. above sea level. Lake Okechobee (800 sq. m.), a freshwater lake which drains an area of some 6,000 sq. m., but has no direct outlet, lies immediately north of the Everglades; and its flood waters, overflowing southward, are the chief supply of water to the Everglades. Its surface is 20 to 23 ft. above sea level. The Everglades muck contains some 70 per cent. of organic matter, and is high in nitrogen (2 per cent.). Agricultural experiments have shown it to be fertile when suitably drained and treated, with special advantage for sugar-cane culture. Drainage of the Everglades has been agitated since shortly after 1840, but progress was made only since 1907, when the State took the work actively in hand. Earlier canals were cut from Lake Okechobee west to Caloosahatchee, and above the lake, to drain marshes around the lake. Recent plans involve a series of parallel canals from the Atlantic Coast northwesterly through the Everglades to the lake. In 1930 the drainage district covered 4,927,759 acres, of which one-quarter, owned by the State, was valued at \$105,000,000. Motor highways have been built and crops of garden truck and sugar cane have been grown on the reclaimed land.

Consult articles in *Ouing* (January, 1909); *World To-day* (May 1909); *Putnam's Magazine* (April, 1910); *Scientific American* (Jan. 21 1911); *Cassier's Magazine* (March, 1911); *Everglades of Florida* (U. S. Senate Document No. 80, 62d Congress, 1911).

Evergreens are trees and shrubs which display a covering of foliage all the year round, as contrasted with the deciduous plants, whose branches are bare a part of the year. Evergreens are of two classes: the *conifera*, or cone-

bearers, with resinous, needlelike foliage, as the pine, cedar, arbor vitae, etc.; and the *sclerophyll* type, like the holly, laurel, box, rhododendron, etc.

Everhart, Benjamin Matlack (1818-1904), American botanist, was born in West Whiteland, Pa. He helped edit the *Journal of Mycology* from 1885 to 1888, and with J. B. Ellis published *North American Fungi* and *North American Pyrenomycetes* (1892). Some of the principal American fungi bear his name.

Everlastings, or *Immortelles*, are flowers which retain their form and much of their color for a long while after being picked and dried. They are frequently used in combination with dried ornamental grasses to make winter bouquets for home decoration. The most important are the species belonging to the genus of composites known as *Helichrysum*, natives of Cape Colony and Australia. *H. bracteatum*, the ordinary garden variety, is one of the best. It bears large orange flower-heads, composed of dry bracts, though there are numerous varieties ranging in color from pure white to deep blood-red.

Evesham, market town and summer resort, Worcestershire, England. Here a Benedictine abbey was founded in the eighth century; a fine tower and gateway still remain. At Green Hill, to the n. of the town, Simon de Montfort was defeated by the Royalists under Prince Edward on Aug. 4, 1265; an octagonal tower in the grounds of the Abbey Manor House marks the site of the battle.

Eviction. In law, some act by a landlord which is considered to deprive the tenant of his possession or rightful enjoyment of the premises in question. It may be the process of law, or by rendering the premises uninhabitable in some way. See LANDLORD AND TENANT.

Evidence, the means sanctioned by law by which alleged facts are established or disproved in judicial proceedings. It is to be distinguished from argument based upon the facts, which can only suggest explanations of or inferences from them, and is not accepted as part of the proof. The methods of proving facts may be classified as follows: by the testimony of witnesses; by the introduction and authentication of documents containing matter relevant to the issue; and by real evidence, or the production and inspection of an object which is part of the subject matter involved in a case.

Evidence may be *direct*, that is, a complete chain of facts tending to corroborate or establish the alleged facts in controversy; or *circumstantial*, which consists in the establishment of facts from which a logical inference can be

drawn as to the truth or falsity of the facts in issue. It is as to the legal admissibility of evidence that most questions arise, and most rules exist. The law requires that the best or most convincing evidence possible under the circumstances shall be adduced, and the courts refuse to receive less satisfactory evidence, unless it is shown that the best is not obtainable. Another general rule is that parol evidence cannot be introduced to vary the terms of a written instrument, but only to explain it. Certain presumptions may be based upon facts proved, which have the effect of evidence until rebutted.

It is a general rule that unsworn statements of a person may not be repeated by a witness on the stand. This is known as the 'hearsay rule.' The objection to such testimony is that it is not entitled to much weight, as the statements were not made under the solemnity of an oath and may have been carelessly made, and the person making them was not subjected to cross-examination. However, the difficulty of proof in certain classes of cases has caused the courts to make a number of recognized exceptions to this rule. One of these is the '*res gesta* rule,' under which exclamations or unpremeditated statements made by a party to a transaction at the moment it happens, or, in some States, very shortly afterwards, may be admitted, as a part of the transaction.

In general, an ordinary witness is not permitted to give his opinion of anything connected with the issues; it is for the jury to draw inferences from the facts. However, it is common to call 'experts' to give their opinions in cases where the jurors are not well qualified to grasp some matter of technical knowledge in issue. Where possible, anything involved in the issues of a case is produced in court, so that the jury may inspect it.

The burden of proof of facts alleged is upon the party who alleges them. This rule is so rigidly enforced that if a plaintiff who has a good case to which there is no valid defence, fails to prove in court the facts constituting his cause of action, judgment will be entered for the defendant. The burden of proof never shifts, but the burden of evidence may do so in the course of a trial. The matters of the competency and privileges of witnesses are also regulated by the rules of evidence.

A party may not directly impeach the credibility of a witness called by himself, and may not ask leading questions, questions suggesting the answer by their form, of his own witness. However, he may do both in cross-examination of his opponent's witnesses. Consult Stephen's

Digest of the Law of Evidence and Greenleaf's *Treatise on the Law of Evidence*. See TRIAL.

Evil may be generally defined as that which is opposed to the divine order of the universe. Every form of religion testifies to the recognition of evil in the external world, and superstition in all its shapes mainly rests upon it.

The theories of compromise seek to explain evil as being due to the presence of some definite evil principle that wars against, or some refractory element that obstructs, the triumph of the good. They are thus dualistic. Such dualism is exemplified in the Manichæan heresy, and in modern times was regarded by J. S. Mill in his *Essays on Religion* as a natural and plausible explanation of the mixture of good and evil in the world.

Evil Eye, the power of exerting an evil influence or fascination on any one by a glance from the eyes, one of the most venerable and widespread of human beliefs, sanctioned alike by the classical authors, the Fathers of the Church, mediæval physicians, savage races everywhere, and modern usage in many countries within the range of Christianity. Especially powerful is the belief among the Neapolitans, and to raise the cry '*jettatore*' in Naples is to cause a panic. Various devices are used as a protection against the evil eye.

Evolute. See **Curve**.

Evolution, literally an unfolding, a gradual development from a simple or crude beginning to a more complex or complete form. In this sense the term evolution has a wide application, and we speak properly of the evolution of such diverse developments as the steam engine or locomotive, a political party, or a system of philosophy or religion.

In connection with the natural world, however, evolution has come to possess a special significance. As opposed to the doctrine of special creation, which teaches that things were made or created by some supernatural being or force, unlike the agencies now at work in the natural world—the doctrine of evolution teaches that the present order of things is the result of natural forces operative in the remote past as they are at the present time. It does not, however, preclude a specific creation of a rudimentary form by a first cause. While this theory of evolution applies equally to organic and inorganic matter, it is probably used more commonly in connection with the development of living forms, and it is in that sense that it is dealt with in the present article.

The theory of organic evolution is the theory

that all forms of life are derived, by gradual modification, from earlier and simpler forms, or from a single rudimentary form. This conception may be said to contain the following elements: (1) A series of distinct forms or types (*viz.* the species of animal life) exists representing definite stages in the process of evolution; (2) these forms are joined together as stages in a continuous process of change which a principle or substance fundamentally the same in all the forms (*viz.* protoplasm, or, more strictly, animal life, however that may be defined) undergoes; (3) the process of change is determined by the intersection of the given principle with its given environment; (4) the process of change may be regarded as a process of approximation to a highest or latest type (*viz.* man).

The evidences of evolution are sought by its advocates in the study of comparative anatomy and of comparative embryology, in the nature of fossil remains, and in the phenomenon of geographical distribution. A study of comparative anatomy, they hold, reveals the fact not only that certain great groups of animals, as the mammals, reptiles and birds exhibit certain fundamental characteristics indicative of a common ancestry, but that the basic characteristics of each group can invariably be traced back to a group lower in the scale of animal life. No other doctrine, the scientist claims, so reasonably explains the great similarities and minor differences to be observed in the various groups of animals, as the doctrine of evolution—that is, descent from a common source, with adaptive modification.

The bearing of geographical distribution on the problem of evolution lies in the fact that the difference between the species of two regions varies directly with their degree of isolation or proximity. Thus the lizards of the Galapagos Islands resemble those of South America, the nearest mainland, rather than those of the European or African continent, indicating a common ancestry in spite of the adaptive variations that have differentiated them from their neighbors.

According to the Darwinian theory, which is the theory of evolution now generally accepted by evolutionists, evolution as it has already taken place and as it is in progress to-day is determined, immediately at least, by what is known as natural selection. No two individuals are identical, variations occurring as the result of environmental, functional, and congenital or hereditary influences. In the great struggle for existence, due largely to the

excessive reproduction of the species, the unfit perish—are eliminated; only the fittest survive, due to the fact that they have characteristics which enable them to persist beyond others. According to Darwin, it is these characters—and these alone—that possess ‘a real power in the evolution of species.’

According to the evolutionist, man takes his place in the evolutionary scheme just as truly as do the Protozoa, the Amphibia, the reptiles, birds, and lower mammals; and it is just here that the evolutionist and the believer in special creation find their greatest point of divergence. The evolutionist reasons as follows: A study of the human organism shows it to belong first of all to that division of animal life known as the vertebrates, while certain definite characteristics place it in the subdivision mammalia. It would, however, still be possible that man constituted a separate order which he shared with none of the so-called lower animals, but that he is unmistakably linked by certain peculiarities of structure and habit with that group of animals known as the Primates, of which the distinguishing characteristics are: the placental attachment of the unborn young within the parent; the prehensile limbs; the number and structure of the teeth; the number of digits; the superior development of the clavicles; the structure of the eye socket; and the possession of two mammary glands at which the young are suckled. Against these common characteristics, are set the distinctive features of the human race—man’s erect carriage and his greater brain development, with the resulting powers of speech and reason; and even these, say the evolutionist, are differences of degree alone. Passing from the Marmosets, the lowest order of the Anthropoidea (one of the two great divisions of the order of Primates) to the tailed monkeys, thence to the baboons, and to the true apes (*Simiidae*), to which belong the gibbon, orang-outang, chimpanzee, and gorilla, one finds a progressive development of the brain and an increasing tendency to assume an upright posture—in short, an increasing resemblance to the human species, which forms the culmination of this order. Add to this the presence in the human organism, particularly in the stages of infancy and fetal development, of certain rudimentary structures—as the vermiform appendix—appearing in a higher degree of development in the lower Primates; the development of the human embryo from a single cell, through various stages recapitulating the history of the race; and the evidence of fossil remains and the geographical distribution of the races

of mankind; and the evolutionist holds that this theory of physical evolution, at least, is complete.

The evolution of man's mind is based on the invariable relationship between the mind, as we ordinarily conceive it, and the human brain. It is traced by studies similar to those by which physical evolution is established—comparative psychology furnishing evidence comparable to that of comparative anatomy in the physical realm, supplemented by the study of the development of the brain and of the mental processes in fetal and pre-adult life, and by the records of historic and prehistoric races.

The mental development of man from childhood to maturity is cited as still further evidence of the evolutionary process in the mental realm. The reflex and mechanical activities of the new-born infant, corresponding to those of the lower animals, give way gradually to a higher order of intelligence in the child of seven or eight months, that is in turn superseded, or supplemented, by the development of reasoning powers, simple at first, but gradually reaching their fullness with the advance from adolescence to manhood.

The theory of evolution is not a product of the 19th century—an idea which had its origin with Darwin. It was foreshadowed by Lucretius, Empedocles, Aristotle, and other early philosophers, and appears, although somewhat vaguely, in the middle ages. Descartes' mechanistic view of the universe, and the theory that the genera of all beings follow one upon another in a continuous progression, as held by Leibnitz, and by Herder and other German philosophers, are early modern manifestations of the theory.

It remained, however, for Charles Darwin to formulate a theory that proved acceptable to a large body of scientists, though Alfred Russel Wallace working independently, arrived at similar conclusions at practically the same time. For a fuller discussion of their theory, based on natural selection, see **DARWINISM**.

The Darwinian theory has been the theme of a wide range of literature, and its protagonists and opponents have been numerous. Among those who have upheld it and contributed to it the results of further investigation are Hooker, Huxley, Müller, Haeckel, Herbert Spencer, who treated the subject from the philosophic point of view, Weissmann, Mendel, and De Vries. For the contributions of these investigators the reader is referred to the articles, elsewhere in this work, dealing with

their lives. The opponents of the theory of evolution attack it as merely an hypothesis, unsupported by facts.

It is declared also that the theory of evolution fails to account for the origin of life, and that its explanations of natural phenomena are 'fantastic and unbelievable.' Furthermore, it is at variance with the Biblical record of creation, which declares that God made man in His own image, and constitutes, therefore, a direct attack upon the Bible as an inspired book. It tends to weaken man's belief in a personal God, upon which rest all the great controlling influences of life. If carried to its logical conclusion, it destroys the whole structure of the Christian faith, and leaves man 'adrift upon a tempestuous sea without chart or compass to guide him.' The doctrine of the 'survival of the fittest' is cited as the real basis for the vicious teaching that 'might makes right,' as a breeder of class consciousness and of industrial conflict. In short, its enemies declare, the theory of evolution, without a basis of fact, substitutes a man-made theory for the revelation of God, replaces the spiritual by the material, and leads to agnosticism and eventually to atheism.

Bibliography.—In connection with the subject of Evolution the reader is referred to the articles in this work dealing with **BIOLOGY**, **HEREDITY**, **EMBRYOLOGY**, and **PALÆONTOLOGY**.

The literature of the subject is extensive, and only a few of many treatises may be mentioned here. Special reference is made to Crampton's *The Doctrine of Evolution: Its Basis and Scope* (1911) as a clear concise treatment of the subject for readers not scientifically trained. Consult also Darwin's *The Origin of Species*; Eimer's *Organic Evolution*; Weissmann's *Studies on the Theory of Descent* and *The Evolution Theory*; Clodd's *Story of Creation, Pioneers of Evolution*, and *Primer of Evolution*; De Vries' *Species and Varieties*; Butler's *Evolution Old and New*; Kellogg's *Darwinism To-day*; Osborn's *Origin and Evolution of Life*; Tyler's *Man in the Light of Evolution*. William Jennings Bryan's *In His Image* and A. W. McCann's *God—or Gorilla?* are works setting forth the views of the opponents of the theory.

Evolution, in mathematics. See **INVOLUTION**.

Evora, town and archi-episcopal see, Portugal, capital of the province of Alemtejo. Its Moorish and mediæval character makes it one of the most interesting towns in Portugal. Noteworthy buildings are the Cathedral, built in the 12th and restored at the close of the

13th century; the Public Library; a Roman Temple of the 1st or 2d century A.D.; the former Jesuit university, now a police-office grammar school and orphanage; and an ancient Roman aqueduct still in use; p. (1911) 17,901.

Evremond, Charles Marguetel de Saint-Denis, Seigneur de Saint (1613-1703), French essayist and poet, was born in St. Denis, near Coutances, in Normandy. During the Thirty Years' War he won renown at Rocroi, Freiburg, and Nördlingen. At court he was esteemed the brightest and most versatile of the many wits of the day. As a critic and letter-writer, Saint Evremond's style reaches a high state of perfection, with its sententious brevity, incisive wit, and polished antithesis. His collected works were published in 1705 (Eng. trans. 1728). Consult *Life*, in French, by Macé (1894).

Evreux (Lat. *Eburovices*), town and archiepiscopal see, France, capital of department Eure. Its most interesting buildings are the Cathedral (11th century), restored in 1896, with Cloisters and the Bishop's Palace adjoining; the Tour de l'Horloge, or clock tower (1490); the church of St. Taurin; and the Palais de Justice. A Roman settlement four miles southeast of the present town was destroyed by the Franks under Clovis, and the succeeding town was overthrown by the Norsemen at the close of the 9th century. Evreux was twice destroyed by fire, by Henry I. of England, and by Philip Augustus of France; p. 18,957.

Ewald, Georg Heinrich August von (1803-75), German orientalist and theologian, was born in Göttingen. He was an opponent of the Tübingen school, was a profound scholar, and had much of the fiery spirit of the ancient prophet of Israel. His greatest work, and the ambition of his life, *The History of the People of Israel* (Eng. trans. 1867-86), was completed in 1859.

Ewald, Johannes (1743-81), Danish poet, was born in Copenhagen. In 1773 he settled at Rungsted, where he wrote his famous ode *Rungstedts Lyksaligheder* and the heroic opera *Balders Død* (Eng. trans. *The Death of Balder*, 1889). To a later period belong his fine lyrics *Til Sjaelen* and *Til min Moltke*. In 1778, at the request of the queen-dowager, his *Balder* was acted at the Royal Theater, and in the same year he wrote his most beautiful work, the opera *Fiskerne* and the fine autobiographical *J. Ewalds Levnet og Meninger*. Consult *Life*, in Danish, by A. D. Jørgensen.

Ewe, a linguistic group of Negro people of

the Slave Coast, West Africa, whose domain lies between Yorubaland and the river Volta, comprising the former German and present French colonies of Togoland and Dahomey. They present the usual characteristics of the uncivilized Negro.

Ewing, James (1866-1943), Am. pathologist, was born in Pittsburgh, Pennsylvania. In 1907 he was named director of the Association for Cancer Research. His works include *Clinical Pathology of the Blood* (1900-3); articles on the *Blood* (*Text-Book of Legal Medicine*, 1910); *Neoplastic Diseases* (1919).

Ewing, Juliana Horatia (1841-85), English writer for children, was born in Ecclesfield, Yorkshire, a daughter of Margaret Gatty, author of *Parables from Nature*. Most of her stories, before separate publication, appeared in *Aunt Judy's Magazine* (1866), edited by her mother and, after the latter's death, by Juliana and her sister. After her marriage to Major Ewing (1867), she cultivated a deep interest in soldiers, shown strikingly in many of her tales. Her best known stories are *Jackanapes* (1884), *Jan of the Windmill* (1876), *Six to Sixteen* (1876), *The Land of Lost Toys* (1869).

Examination, in education, a form of test designed to show the student's familiarity with subjects already pursued or to demonstrate his fitness for more advanced work. In the days of the mediæval universities, admission to the degree in arts was conditioned by the candidate's skill in defending a thesis in a public disputation. After the Reformation such debates gradually gave way to the modern system of examination by questioning. At the present time college and university examinations are usually conducted in writing. For the higher degrees, a thesis on some phase of a study is also required.

Admission to college usually depends on a formal examination on specified subjects. Of late years there has been a tendency to unify these requirements, and in 1900 a College Entrance Examination Board was organized. In 1911 Harvard University adopted a plan, later accepted by Yale, Princeton, Smith, Vassar, Wellesley, Mount Holyoke, and others, whereby a student may satisfy the entrance requirements by passing examinations in each of a few subjects, known as 'comprehensive examinations'; and beginning in June, 1916, a series of this type was adopted by the College Entrance Examination Board. The passing of these comprehensive examinations may be accepted for admission as an alternative to the passing of the usual Board

examinations. For competitive examinations, see also CIVIL SERVICE.

Exanthemata, a term applied in medicine to those fevers which are accompanied by skin eruptions, such as scarlet fever, measles, and small-pox. Sometimes, but not so generally, it is applied also to rashes unaccompanied by fever.

Exarch, in the Roman empire, the title borne by the viceroy of the Byzantine emperor in Italy, from the 6th century to the 8th. Ecclesiastically, exarch was a title intermediate between patriarch and metropolitan.

ING; STEAM SHOVEL. Consult McDaniel's *Excavating Machinery* (1913).

Excellency, a title of honor, given in the United States to governors of States, and to U. S. ambassadors and ministers to foreign countries. The title is borne in Great Britain by the ministers of foreign powers, and outside Britain by ambassadors, plenipotentiaries, viceroys, and governors of colonies.

Excelsior, a packing material consisting of wood shavings of varying degrees of fineness.

Excess-profits Tax, a tax levied on business profits when these exceed a moderate per-



Courtesy of the Bucyrus Co.

Electric Shovel for Mines and Quarries.

Excavation and Excavators. Excavation is the process of removing rock or earth for the purpose of making a railway cutting, a canal, or a dock, of driving a tunnel or sewer, or of clearing a space for the foundations of a bridge, wall, or building. In cases where deep trenches for retaining walls have to be excavated, the soil is often lifted out in large buckets by cranes standing up above. If rock is met with, the part to be removed is first shattered by charges of explosives placed in holes drilled for the purpose. The sides of excavations for foundations have, unless of rock or other unyielding formation, to be supported by a system of timbering. Two general types are steam or electric shovel and a type of excavator resembling a dredge. See DREDG-

centage of the capital invested. During the Great War (1914-19) the increased demand for certain products such as iron and steel, munitions, and ships, caused a marked stimulation of the industries concerned with their production, with the result that huge profits were made by the manufacturers. Such profits, it was held, should be particularly liable to taxation since it is incompatible with the principles of true democracy for one class of people to profit by a war which is causing loss and suffering to the rest of the nation. The excess-profits tax was repealed by the Revenue Act of 1921, the repeal becoming effective Jan. 1, 1922, and no excess-profits taxes were levied thereafter.

Exchange, an ancient mode of conveying

real property, by the mutual grant of equal interests in different pieces of land, the one for the other. This form of transfer is abolished in England by statute, and is obsolete in the United States, such mutual grants being effected by deeds.

Exchange, a name applied both to the place where merchants meet at certain hours for the transaction of business, and to the assemblage itself. See SPECULATION; STOCK EXCHANGE.

Exchange, in political economy, means the giving of what we have, but do not particularly require, for that which we want, but have not.

Exchange has existed from the earliest times. As soon as the primitive division of labor into agriculturist, weaver, smith, and carpenter was established, there must have followed a mutual exchange of the produce of these callings. But the early exchange was practicable only under very restricted local conditions, for the means of transport and communication were not sufficiently developed to convey the staple commodities of industry over great distances.

The growth of a world-wide exchange has naturally led to a corresponding development of the instruments of exchange. Money has been described as the mechanism of exchange and other more refined devices. These may be summed up in the term 'credit institutions,' of which banks are the most important example. See BANKING; ECONOMICS; EXCHANGE, FOREIGN; SUPPLY AND DEMAND.

Exchange, Foreign, the mechanism by which payments between different countries are effected; in ordinary commercial discussion the rate at which the currency of one country is valued in that of another.

In international trade only a small fraction of the value of the goods exchanged is ever transferred in actual money. Obligations are met by offsetting debits with credits, and money is used only for the occasional settlement of balances. The exchange is not actually carried on by the individual immediately concerned but is handled by bankers and brokers who act as intermediaries and buy and sell the bills of merchants and traders.

The rate or price of exchange is determined by the same factors which determine the rate of exchange of any other market commodity. In other words, it is an expression of the interaction of demand and supply. Three factors are generally involved: (1) the amounts of pure gold in the monetary units to be exchanged, (2) the cost of shipping gold, and (3) the trade and credit relations of the two countries.

Bills of exchange are drawn for varying periods of time, and the length of the term for which a bill is drawn affects the rate at which it will be accepted. In the case of long-time bills, the condition of credit and rates of interest in both countries affect its value, for the buyer must consider the loss of interest until the bill matures and must be compensated for the risk involved.

During the abnormal conditions of the World War, rates of foreign exchange suffered wide fluctuations, due largely to the distortion of the balance of trade in favor of the neutral nations, and to the issue of great volumes of irredeemable paper currency issued by many of the belligerents.

Consult J. S. Mill's *Principles of Political Economy*; R. T. Ely's *Outlines of Economics*; R. T. Ely and G. R. Wicker's *Elementary Principles of Bankings*; W. A. Scott's *Money and Banking* (1926 ed.).

Exchequer, that department of government concerned with the public funds.

Exchequer Bills, documents of credit formerly issued under Parliamentary authority by the British government in return for monies advanced to it. Except for renewals, there has been no issue since 1861; since that date the treasury has used chiefly Treasury Bills and Exchequer Bonds.

Exchequer Bonds are issued by the British government at various times to cover current expenses which cannot be met from the ordinary sources of taxation.

Exchequer, Chancellor of the, one of the principal members of the British government and the first finance minister of the crown, with a seat in the Cabinet. He has the complete control and management of all matters relating to the receipt and expenditure of the public money. The chancellorship can be held by the Prime Minister if he is a member of the House of Commons, the noteworthy cases being those of William Pitt (1804-6), George Canning (1827), Sir Robert Peel (1834-5), and W. E. Gladstone (1873-4 and 1880-2).

Excise Taxes, consist generally of taxes laid upon the manufacture, sale, or consumption of commodities within a country, upon transactions, and upon certain callings or occupations, the latter often taking the form of licenses to pursue these callings. Excise taxation in its modern form was first developed in Holland, where in the 17th century it was the chief fiscal reliance. It was introduced into England at the time of the struggle between Parliament and Charles I., and was employed extensively under the Protectorate, taxes being

levied upon many articles of food and clothing.

In America the excise system was used in the colony of New Netherlands soon after its establishment. It was extended, after the colony passed under English rule, to the other Middle Atlantic colonies, and in 1737 to Massachusetts. Its first use by the Federal Government under the law of 1791, imposing a tax upon spirits, encountered violent opposition, resulting in the Whiskey Insurrection in Pennsylvania in 1794. After the Civil War most of the excise duties were repealed; by 1870 the only important ones retained were taxes on spirits, fermented liquor, and tobacco.

To compensate for the fall in revenues from customs duties caused by the World War, the War Revenue Act of 1914 again increased the tax on beer and wines and imposed license taxes on bankers, brokers, and proprietors of theaters, circuses, etc. Stamp taxes were applied to promissory notes, insurance policies, deeds and conveyances, bills of lading, power of attorney, tickets of passage to foreign ports, and on the sale of cosmetics and toilet articles, and special taxes were levied on telegraph and telephone messages.

More recent Revenue Acts have levied special taxes on admissions and club dues, on certain articles produced and sold, such as automobile bodies and accessories, motorcycles, etc., on distilled spirits and cereal beverages, on certain legal documents and on bonds, debentures, and certificates of stock and of indebtedness. (See **TAXATION**.)

State excise taxes consist chiefly of franchise and other corporate taxes, a variety of excise taxes on public service industries, business license taxes, motor vehicle and gasoline taxes, sales, severance and regulatory taxes. Consult *Annual Reports* of the U. S. Commissioner of Internal Revenue; E. R. A. Seligman's *Essays in Taxation* (9th ed., 1921); H. L. Lutz' *Public Finance* (1924); J. P. Jensen's *Problems of Public Finance* (1924).

Exclusion Bill. See **JAMES II.**

Exclusive Brethren, or Darbyites. See **PLYMOUTH BRETHREN.**

Excommunication, an ecclesiastical punishment by which offenders are excluded from participation in the rites of the Church. It can be inflicted only upon living, baptized persons who are in possession of their reason and of moral liberty, and who know both the law and the penalty for its transgression. It does not annul any man's baptism, but merely excludes him from the benefits of baptism while it continues.

Among the Jews the first trace of an ecclesi-

astical ban is found in the time of Ezra, who declared certain offenders 'separated from the congregation.' For 2,000 years excommunication continued to be the most effective means of discipline in the power of the synagogue, but to-day it is practically extinct.

The Roman Catholic Church classifies major excommunication as *a jure* and *ab homine*. The former is provided for in the law of the Church, the latter is imposed by an ecclesiastical prelate. Finally, excommunication may be either reserved or non-reserved, according as absolution is reserved to a particular person or may be performed by any confessor. Excommunicated persons are either *vitandi*, to be shunned, or *tolerati*, to be tolerated.

The power of excommunication within a diocese rests with the bishop. It may also be exercised by the prelate nullius for quasi-diocesan territories, by regular prelates for religious orders, and by the Pope for the Church at large.

The churches of the Reformation continued the practice of excommunication, and for a time it was accompanied by loss of certain political and civil rights. In England, the last of these were removed by statute in the time of George III.

In the United States, excommunication naturally involves nothing more than separation from the ecclesiastical body which pronounces the bans. Consult the *Catholic Encyclopedia*; Taunton's *Law of the Church* (1906).

Ex dividend (abbreviated into *ex div.* or *xd*), a Stock Exchange term, meaning that the price at which any stock or share is quoted is one which does not entitle the purchaser to receive the dividend which is about to be paid in respect of it.

Execution, the final writ or process of a court whereby its judgment is enforced. It may be directed against the body of a party to an action, serving as a warrant for his arrest, in which case it is commonly known as 'body execution,' or it may direct the sheriff or other officer to levy upon and seize the property of the party named therein, when it is known as 'execution against property.' See **JUDGMENT**; **DECREE**; **DEBT**. Consult Freeman's *Treatise on the Law of Executions*.

Execution, in criminal practice, may be used generally to denote the carrying out of any sentence, but is specially applied to the carrying out of the death penalty.

Executioner, the official who executes a death sentence ordered by a court. The office is an ancient one. In Rome its duties were divided between the lictors, who seized and

punished citizens, and the carnifex, who tortured and crucified slaves and foreigners. In the Frankish empire the execution of the death sentence usually devolved upon the accusing party, or upon the community which rendered the sentence. At a later period the *scharfrichter* and the *henker* were the official executioners, the former beheading the victim, while the latter carried out all other death sentences. In Great Britain the office was sometimes hereditary, and sometimes included in the duties of other positions. In recent times the London executioner has acted for all England. In France, this official is called *Monsieur de Paris*; and there the family of Sanson was long associated with the office.

In the United States the county sheriff is the executioner for his district in some States; in others, the warden of the State prison technically holds the office, though it is actually filled by some subordinate. Military execution is one of the duties of the provost marshal.

Execution of Deed. See **Deed**.

Executive. In common language, the executive authorities in a state comprise all those persons and bodies which are engaged in directly enforcing or carrying out the provisions of existing laws, or, even more widely, all those representatives of the state who are not engaged in legislative or judicial functions.

In the United States, the executive power possesses two distinct functions: the political, such as the calling of a special session of Congress, the carrying on of diplomatic relations with foreign powers, the disposition of military forces; and the administrative, which is concerned with the execution of statute law. The head of the Federal executive authority is the President. See **GOVERNMENT**; **UNITED STATES, Government**.

Executive Officer, United States Navy, denotes the officer responsible for the business organization of the ship. He is a non-engineering line officer, and ranks next to the captain.

Executor, the person named in a will to carry out its provisions as to the disposition of the testator's property, and to act, when letters testamentary are issued by the court having jurisdiction, as his personal representative in all matters pertaining to the administration of his personal estate. Any person of full age and not under legal disability may be an executor; but a person named in a will as executor may refuse to serve. Not infrequently a trust company is named as executor; and in some States such a corporation qualifying as executor is not required to give bond. See **ADMINISTRATION**; **WILL**.

Executory Devise, a gift by will of a future interest in real or personal property, which is not a remainder, either because it may take effect after or in derogation of a conditional fee, or because there is no preceding or 'particular' estate to support it. See **DEVISE**; **REMAINDER**; **TRUSTS**; **WILLS**.

Exegesis, a Greek term meaning the exposition or interpretation of any writing, but almost exclusively used of the critical interpretation of the Holy Scriptures. There are several distinct forms of exegetical writing. Of these, the simplest are the *gloss*, which explains or translates an unfamiliar or foreign word, and the *scholium*, which extends beyond the explanation of a single word to a phrase or sentence. The *commentary* undertakes to explain an entire writing, rather than isolated words and expressions; the *translation* goes a step beyond this, substituting for the Hebrew and Greek of the Old and New Testaments the language of the people, and thus making the Scriptures directly accessible to all; the *paraphrase* combines both translation and commentary.

In the history of exegesis two main currents may be discerned—the literal and the allegorical. When writings have come to be looked upon as weighty and authoritative, or are canonized as divinely inspired, exegesis becomes the indispensable medium of applying their teaching. Thus would *a priori* demand a *literal* interpretation; but as the message of a prophet or a legislator to his own time does not always answer the conditions of a later age, there arises the tendency to seek in his words an underlying sense, which gives birth to the *allegorical* method.

In the Middle Ages, exegetical work made little advance. During the 17th century exegesis was employed chiefly for the affirmation or denial of various doctrinal beliefs. The revival of a real exegesis, about the middle of the 18th century, was due mainly to Ernesti and Semler, whose inspiring impulse created a school of men who, in a single generation, contributed more to a sound knowledge of the Scriptures than all the theologians of sixteen centuries. Such were Gesenius, Ewald, Olshausen, and Böttcher (Hebrew); Winer, Buttmann, Lachmann, and Griesbach (Greek).

It remained for the 19th and 20th centuries to furnish the realization of a true philological and historical exegesis. Discoveries in Assyria and Egypt have cast a flood of light and confirmation upon the ancient history contained in the Bible; while the study of New Testament history and of the life of our Lord—sc

characteristic a feature of the more modern theology—has contributed no less to our knowledge of the scope and contents of the New Testament books. Alford, Lightfoot, Ellicott, Jowett, Perowne, A. B. Davidson, Cheyne, Driver, Bennett, Kennedy, Peake, and Charles are a few of the many distinguished exegetes of recent times.

The educational movement in Sunday school work in America and Great Britain has led to the preparation of various exegetical works of a popular character for the use of teachers and adult pupils. See **BIBLE**.

Exemption Laws. See **Homestead Laws**.

Exequatur, in international law, the official recognition of warrant given to an officer of the rank of consul or consul-general by the government of the country in which he has to exercise his functions.

Exercise, the practice of proper forms of physical activity, is an important element in sustaining health and in preventing and curing disease. The general effects of systematic exercise are increased circulation, improved digestion, and the incitement of a greater demand for food and sleep, all of which tend to establish a natural defence for the body.

Exeter, city, parliamentary, municipal, and county borough, and seaport in Devonshire, England, on the River Exe. The chief object of interest is the Cathedral, a grand cruciform structure begun in 1112 by Bishop Warelwast, and dedicated in 1351. Other ancient buildings are the Bishop's Palace (14th century); the Hall of the College of Vicars, incorporated 1401; remains of a Norman castle, probably the representative of still earlier Roman and British strongholds; and the Guildhall, erected in 1330, with Elizabethan façade (1588); p. 60,000.

Exeter Book, The, or **Codex Exoniensis**, a folio ms. given by Bishop Leofric to the library of his cathedral between 1046 and 1073, and dating probably from the first half of the same century. It contains poems whose dates of composition vary from that of *Widsith*, which is certainly older than *Beowulf*, to that of some late poems, which are probably not much older than the ms.

Exeter College. See **Oxford**.

Exhaust. See **Gas Engines**; **Motor Cars**.

Exhibitions, or Expositions. The idea of exhibitions, which have had so important an influence on the advancement of manufacturing art, may be traced back to the fairs (see **FAIR**) held in the various European countries during their earlier history. The modern development of the idea is generally credited to

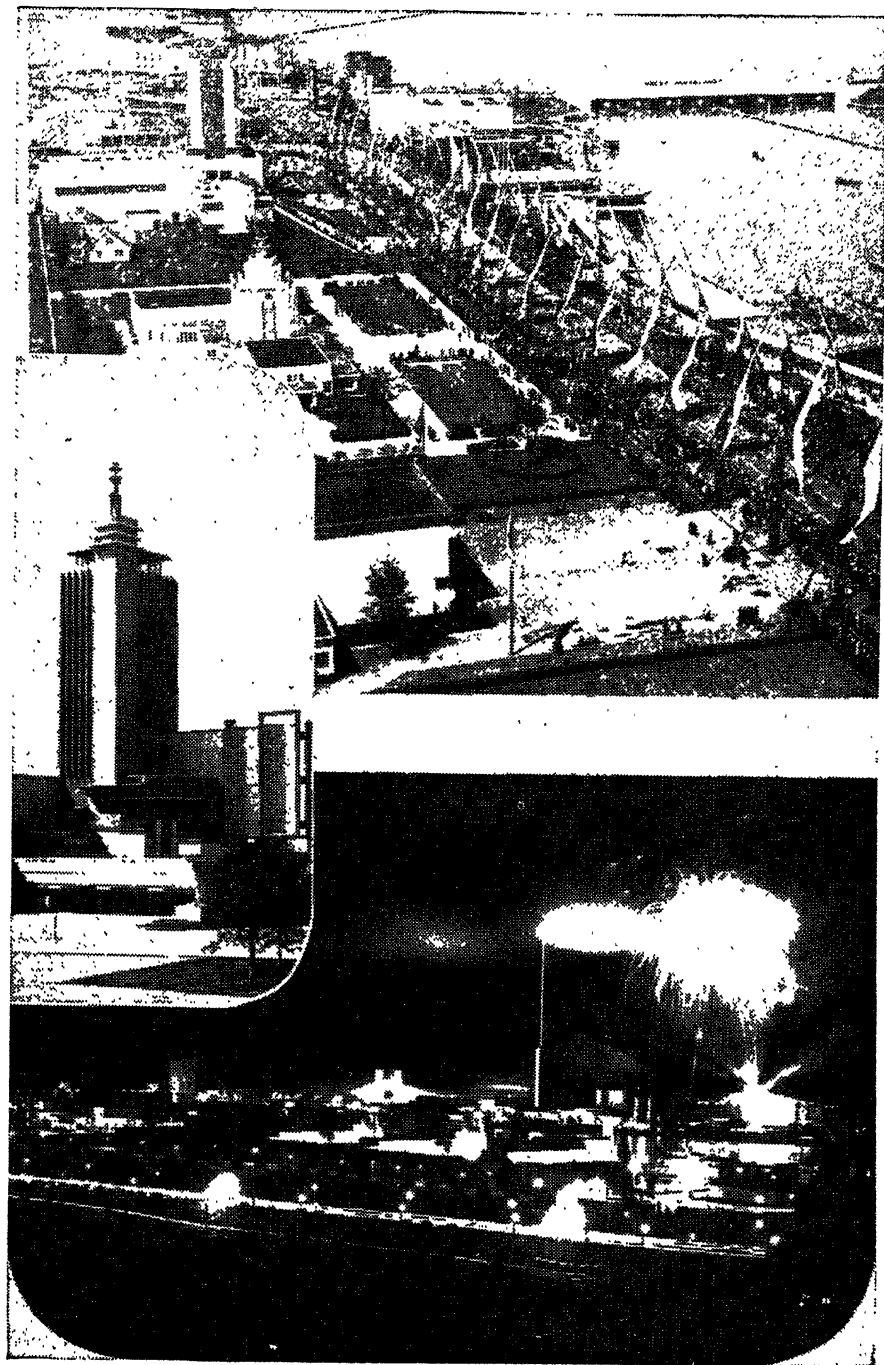
the French, who held the first great exhibition in Paris in 1798.

The era of great international exhibitions began with the opening of the *World's Fair* in the 'Crystal Palace,' Hyde Park, London, on May 1, 1851. The exhibition building, with the exception of the flooring and joists, was entirely of glass and iron. Its total length was 1,851 ft., corresponding with the year; the entire area was 772,784 sq. ft.; and the cost was \$880,000. The building was afterward removed to Sydenham, where an estate was purchased at South Kensington, on which subsequently the South Kensington Museum, the Royal Horticultural Society's Garden, the Albert Memorial Hall, and other institutions were placed.

The *International Exhibition of Vienna*, held in 1873, was the largest and most important exposition that had yet been held. It was visited by 6,740,500 people during six months. The *International Centennial Exhibition* was held in Philadelphia, Pa., from May 10 to Nov. 10, 1876. It celebrated the hundredth anniversary of American Independence, and illustrated the progress and industrial development which had taken place since that event. In 1889 another great *Universal Exhibition* surpassing all its predecessors was held in Paris. It occupied a site of 173 acres, with the famous Eiffel Tower as its principal attraction.

The next great exhibition was the *World's Columbian Exposition*, held in Chicago, Ill., from May 1 to Oct. 30, 1893, to commemorate the fourth centenary of the discovery of America. It was called the 'White City,' and was memorable for the architectural merit of its buildings. These represented the efforts of the most celebrated architects in the United States, and were an important influence in the general improvement of public buildings. It was also noteworthy for its statuary, the work of leading American sculptors being exhibited.

The *Panama-Pacific Exposition*, to celebrate the opening of the Panama Canal, was held in San Francisco, Cal., from Feb. 20 to Dec. 4, 1915. It occupied an area of about 625 acres on the south front of San Francisco Bay, just inside the Golden Gate. There were eleven main buildings, in the Spanish American or Mission style of architecture, grouped around a central Court of the Sun and Stars, at the entrance of which was the famous Tower of Jewels. More than 250 groups of statuary adorned the grounds, and the display of flowers surpassed that of any previous exposition. A



Scenes at The Century of Progress Exposition, Chicago.

large number of congresses and conventions were held. (See PANAMA-PACIFIC EXPOSITION.)

The *Sesquicentennial Exposition*, commemorating the sesquicentennial of the signing of the Declaration of Independence was held in Philadelphia, June-December, 1926.

In 1933, Chicago, Ill., celebrated its hundredth anniversary by opening the *Century of Progress International Exposition*, which was closed in the fall, but again open 1934.

The *Golden Gate International Exposition* at San Francisco, 1939 and 1940, to commemorate the world's largest bridges, trans-Pacific air service, giant water power projects and recent Western achievements generally. It occupied an artificial island made in San Francisco Bay. 17,041,779 persons attended.

In 1939 and 1940 the *New York World's Fair* was held; its theme: "The World of Tomorrow". Occupying 1200 acres of reclaimed land on Long Island, this fair was of surpassing proportions. Among the 44,932,534 visitors were King George VI and Queen Elizabeth, of Great Britain.

Exile. See **Banishment**.

Exile, Jewish. See **Israel**.

Ex Libris, a favorite inscription on book plates, denoting that the volume is one of the collection of the person owning the bookplate. See **BOOKPLATES**.

Exmoor, high moorland and ancient forest, England, near the Bristol Channel. Romantic Lynton, Porlock, and Dulverton have become familiar by the Exmoor romance *Lorna Doone* (Blackmore). Many barrows mark the resting-places of prehistoric people.

Exmouth, Sir Edward Pellew, Viscount (1757-1833), English admiral, was born in Dover. He fought in the battle of Lake Champlain in 1776, and commanded a naval brigade in Burgoyne's campaign in 1777. In 1816 he bombarded Algiers, effecting the abolition of Christian slavery in the dey's dominions.

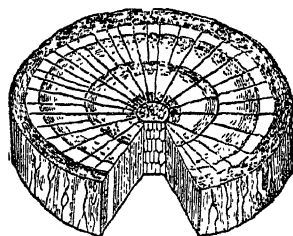
Exodus, Book of, the second book of the Old Testament, whose name is of Greek derivation, meaning 'departure.' In this book Moses tells of the sojourn of the people of Israel in Egypt, their departure from that country, their wanderings in the peninsula of Sinai, the giving of the moral code on Mt. Sinai.

Exodus, The, the departure from Egypt and the journey to Palestine of the children of Israel, described in Exodus, Leviticus, Numbers, Deuteronomy, and Joshua.

Exogamy, the antithesis of endogamy, prohibits the marriage of a man with a woman

of his own clan. For a special inquiry into the subject, consult J. F. M'Lennan's *Studies in Ancient History*, second series (1896). Also Morgan's *Ancient Society*.

Exogens, plants in which new wood bundles are annually formed outside the old wood by the activity of a layer of cambium between the inner bark and the wood. Common examples are the oak and the elm. These layers form what is especially conspicuous in maple and oak—the 'silver grain,' visible in the luster of the wood when cut.



Stem of Exogen (cross section).

Exophagy, that form of cannibalism which prohibits the eating of one's own kindred or tribesmen, this latter practice being known as endophagy.

Exorcism, the ceremony of casting out 'demons,' or, in modern language, 'disease,' from the bodies of persons variously afflicted. Its use in modern times is comparatively rare and is seldom employed except in the rite of baptism in the Roman Catholic Church.

Exostosis, in surgery, an unnatural, circumscribed, bony outgrowth or enlargement, growing from bone only.

Exotic Plants, those which belong naturally to climates other than that in which they are being cultivated.

Expansion, one of the most general results of the rise of temperature of matter, all gases and most solids and liquids increasing in size when made hotter. The expansion of liquids is complicated by the simultaneous increase in the size of the vessels containing them, which reduces the real expansion.

Gases expand far more than liquids or solids and, unlike them, expand more regularly, and practically all to the same extent. Thus, the coefficient of expansion of air is .00367, which is about twenty times as great as that of mercury, seventy times as great as that of brass, and almost exactly the same as that of any other gas. Probably the chief application of expansion is for measuring temperatures; and though, theoretically, gases are the most suitable and solids the simplest, liquids—particularly mercury—are used most frequently.

With liquids and gases, one of the main results of expansion is the formation of 'convection' currents that are caused by the warmed portion of the gas or liquid becoming lighter as it expands, and hence rising. This plays an important part in the production of ocean currents and winds, and is usefully employed in heating buildings by hot water, in the draught of chimneys, and in ventilation. See **HEAT**.

Expansion (in mathematics), the expression of a function in terms of a series of other functions.

Expatriation, the act of voluntarily giving up citizenship or allegiance in one's own country and becoming a citizen or subject of another. The right of a person to make such transfer of allegiance is known as the right of expatriation. Much discussion has centered about this matter. It was finally decided in the United States by act of July 27, 1868, which states that the right of expatriation is inherent in all persons.

Certain treaties between the United States and European countries, entered into since the act of 1868, grant to citizens and subjects the right of expatriation, with certain conditions and qualifications. In case of conflict between any treaty and the act, the treaty is final. No expatriation is legal which is not for a lawful purpose, and expatriation may not take place in time of war.

A citizen of the United States naturalized in a foreign state is automatically expatriated (Act of March 2, 1907). At the Hague conference on codification of international law in 1930, a convention was adopted which was mainly concerned with accomplishing two things: to prevent statelessness of a woman who marries a foreigner by providing that if she does not gain the nationality of her husband, she shall keep her former nationality; to require the consent of a woman before her nationality may be affected by the naturalization of her husband abroad. See **ALIEN**; **ALLEGIANCE**; **CITIZENSHIP**; **NATURALIZATION**.

Expectation of Life. See **ANNUITY**; **INSURANCE**, **LIFE**.

Expectorants, in medicine, a term used to denote those agents which influence expectoration.

Expectoration, the term used to indicate both the sputum, secretion, including mucus, ejected from air passages of head and chest, and the act of expectoration itself. In the case of diseases of the chest, examination of the sputum is sometimes of assistance in diagnosing the disease. See **BACTERIA**.

Expeditionary Force, a body of troops sent from its home base for operation in a foreign country. For an account of the American Expeditionary Force in the Great War see **AMERICAN EXPEDITIONARY FORCES**.

Expenditures, National. The national expenditure of a country is a significant reflection of its wealth and prosperity, its economic policies, and the general enlightenment and welfare of its citizens. In the past few decades in all of the more important countries of the world these expenditures have undergone revolutionary changes in both character and amount.

There has been a spectacular increase in the amount of expenditure. This increase has been brought about by increasing population; by the World War; by a long period of rising price levels; by the increasing urbanization of population, which imposes additional burdens even on the national government; by the modern revolution in forms of transportation, which has brought about a situation similar to the earlier period of railroad and canal building; by generally rising standards of living, which require a higher quality of service on the part of government; and by the increasing socialization of life in general.

But more significant than the increase in amount are the changes in objects of expenditure. In contrast with earlier periods, when national expenditure was concerned almost entirely with military operations either for purposes of defence or of conquest, a large portion of national expenditure is now devoted to the promotion of agriculture, commerce and industry, the development and conservation of natural resources, and the promotion of education, health, and general welfare. It should not be overlooked, however, that the cost of wars, past and present, still makes up the larger portion of national expenditure for most of the countries of the world; but war cost in the United States, 1939, before World War II began, was vastly exceeded by relief expenditures.

A number of significant developments have characterized the expenditures of the Federal Government in the United States, since 1920: The establishment of the budget system; payment of the national debt; a policy of federal aid to the states; a conspicuous increase in expenditures for purposes of social welfare. See **DEBT**, **PUBLIC**; **FINANCE**, **PUBLIC**; **U. S. HISTORY**, **NEW DEAL**.

Consult Ford's *Cost of Our National Government*; Seligman's *Studies in Public Finance*; Guest's *Public Expenditure*; Willoughby's *The*

National Budget System; the National Industrial Conference Board's *Cost of Government in the United States*.

Expenses of a lawsuit are technically called costs in American and English law. See **COSTS**.

Experience is one of the most ambiguous words in the vocabulary of philosophy. When the term is used in what may be called a historical sense, as when we speak of 'learning from experience,' it refers to the past process by which our present knowledge was acquired. When this usage of the term is extended to embrace the present and the future, we get the conception of experience as the continuous process by which the knowledge of any individual grows and widens. And when, finally, we substitute the race for the individual, we have the widest conception of a collective experience embracing the whole life of the race and the knowledge acquired by living it. See **EMPIRICISM**; **RATIONALISM**.

Experience Meeting, a religious meeting at which some of those present give testimony of their religious experiences.

Experiment is distinguished from mere observation by the fact that the observer, instead of merely waiting for favorable conditions (as, for example, the astronomer must do), himself arranges the conditions of the phenomenon to be observed. Consequently, sciences in which experiment can be employed advance much more rapidly and securely than those which are dependent upon mere observation.

Expert, a man of special practical experience or education in regard to a particular subject. An *Expert Witness* is a medical or scientific witness in a court of justice, selected on account of special qualifications.

Exploits River, river, Newfoundland, rising in the southwestern part of the island and falling into Exploits Bay; about 150 m. long, and navigable for 12 m. by steamers.

Exploration, a term meaning the search for new and undiscovered land. The discovery of new lands or of new geographic features dates from remote ages. As early as 604 B.C. Pharaoh-Necho, a Phœnician, went on a three-year expedition which took him down the Arabian Gulf, around the most southerly extremity of Africa into the Strait of Gibraltar, thence to the Mediterranean, and on to Egypt. The historian Herodotus describes this early voyage of discovery. Marco Polo, a Venetian, born in 1254, was the greatest traveller of his time, his travels extending over a period of twenty-six years and covering thousands of miles.

The discovery of America in 1492 by Christopher Columbus marks an epoch in the annals of exploration. Magellan, in his daring and protracted voyage (1519-21), made possible the first recorded trip around the world, although he himself was killed before his vessels completed their trip. In the reign of Queen Elizabeth Sir Walter Raleigh was most active in his efforts to colonize the new lands across the waters. In 1585 he sent out a colony of 108 settlers in seven ships, and in 1587 a second colony of 150 householders, and it was largely through his persistent efforts that England established herself in the New World. In 1595 Raleigh himself voyaged to Guiana and back. In the same century Sir Hugh Willoughby perished in an attempt to discover a northeast passage to Cathay (China) and India, and William Barentz met death on his third voyage (1596), at Icy Cape, Alaska. Henry (Hendrik) Hudson, in search of the Northwest Passage, in 1609 discovered the river which now bears his name, and on the voyage following (his fourth) he navigated Hudson Strait and sailed several hundred miles on Hudson Bay. It was not until the Franklin expedition (1847) that the Northwest Passage, the search for which had cost a heavy toll in lives, vessels, and money, was finally discovered. In the United States, Capt. Robert Gray was the first man to circumnavigate the world under the American flag about 1793.

In 1872 a voyage of research was made by the British steamship, *Challenger*, for the purpose of examining ocean basins and ocean currents, mapping the basins, and determining the physical and biological conditions of the Atlantic, the Southern and the Pacific Oceans. In 1934 and 1940 the Byrd Expedition from the United States discovered vast new territories in the Antarctic region.

Exploration, Polar. See **Arctic Exploration**; **Antarctic Exploration**.

Explosives, substances which may be made to change their condition in a manner to generate force quickly through the evolution of gases whose volume is many times greater than that of the original substance. Explosives may be solid, liquid, or gaseous, but only those of solid form are widely used; and they may be chemical compounds or mechanical mixtures. A considerable number of substances, not ordinarily regarded as explosives, possess the necessary requirements under certain conditions—such, for instance, are mill dust, hydrocarbon gases, vapors of hydrocarbons that are ordinarily liquid; while all gases under

pressure act with destructive violence if the container gives way.

Explosion is a relative term, and applies to the rate at which the substance changes its condition. If this rate is slow, the process is called combustion, chemical reaction, oxidation, vaporization or expansion; if sufficiently rapid to cause injury or destruction to surrounding objects, it is called explosion. Explosions in which the change occurs simultaneously throughout the mass, so that the whole volume of gas is released at practically the same instant, are called detonations.

Explosives are fired by means of heat, flame, chemical action, or shock. Some can be detonated by any of these means, some only by shock. The fact that different shocks of the same apparent intensity give very different results leads to the belief that the disruption of the bonds which hold the atoms in the molecules of explosives is affected more readily by certain varieties of waves of shock than by others. The total force of an explosion depends upon the volume of gas formed, the amount of heat evolved, and the rapidity of formation.

Explosives may be classified in various ways. 1. The 'high' explosives are generally those fired by detonation, such as dynamite which is a mixture of nitroglycerine and a solid. The low explosives are those fired more slowly, such as gunpowder. 2. The 'propellants' are explosives used to give motion to projectiles such as powder in a cannon. The 'disruptives' are explosives used to produce shattering effects and dynamite belongs to this class. 3. Another way of classifying is, by content of the explosive, into pure 'chemical compounds' or 'mechanical mixtures.'

Since the World War much attention has been given to the manufacture of more effective explosives. A powder has been developed which is smokeless, flashless, and non-hygroscopic. This last quality meant a great saving in time formerly used in drying powder. The danger of careless manufacture and handling of explosives is very serious, and has become more and more appreciated as the manufacture, transportation, and use has increased. Nearly all countries in the world now have acts regulating the operations involving explosives.

No doubt the ancients noticed that certain substances were explosive, but it does not appear that any important use was made of this knowledge. The most celebrated of the early incendiary mixtures is *Greek fire* which seems to have been known in the 7th century. Its composition is variously given. In a descrip-

tion attributed to Albertus Magnus (about 1240 A.D.), it is said to consist of sulphur, salt, Persian gum, pitch, and oil. Other sources say sulphur, crude petroleum or naphtha, crude saltpeter, pitch, and other substances. Such a mixture is evidently explosive, and quite probably it eventually developed into gunpowder, which is first heard of in the 13th century. Black gunpowder remained the only explosive of importance until the middle of the 19th century. In 1845, Schönbein discovered the explosive nature of guncotton; in 1847, Sobrero discovered nitroglycerin; and in 1866 Nobel invented dynamite. Since then a considerable variety of explosive mixtures have been devised for a wide range of uses. The first smokeless gunpowders were made between 1860 and 1870, but they lacked keeping qualities and uniformity of performance, which were finally obtained in a guncotton powder devised by M. Vieille in 1886.

Consult Guttman's *Manufacture of Explosives*; Bernadou's *Smokeless Powders*; Farmer's *Classification and Use of Explosives* (1921); Marshall's *The Manufacture and Testing of Military Explosives* (1919); McFarland's *Ordinance and Gunnery* (1929).

Exports and Imports.—*Exports*, to give the term its most common meaning and speaking from the standpoint of a given country, are commodities, including gold and silver, sent outward across that country's borders to other parts of the world. *Imports*, defined from the same standpoint, are commodities, including gold and silver, coming inward across the country's borders from other countries. There is a growing tendency to call the outward and inward movements of commodities and precious metals 'visible exports and imports' and to recognize the existence of 'invisible exports and imports' (*i.e.*, invisible because they do not pass through governmental customs houses) that take such shapes as stocks and bonds and services rendered by people of one country to people of another. Thus an insurance policy issued by a British insurance company to an American firm would be an invisible import into the United States of protection against loss; while an investigation made by an American firm of consulting engineers for a British company would be an invisible export of technical services.

The volume of goods visibly exchanged every year between the countries of the world is very great, as shown by the following figures compiled by the United States Department of Commerce:

Visible Exports and Imports (in Millions of Dollars) of Leading Countries in 1938 (excluding gold and silver)

	Ex- ports Total	Im- ports Total	Ex- ports, Dol- lars Per Capita	Im- ports, Dol- lars Per Capita
United States	3,094	1,960	24.	15.
United Kingdom	2,607	4,525	55.	96.
Canada	1,084	795	99.	73.
Germany	2,261	2,428	29.	31.
France	880	1,324	21.	32.
Italy	546	585	12.	13.
Japan (1937)	903	1,076	13.	15.
World (except Spain) (1937)	*	27,305		

* NOTE: Export figures not given to avoid double counting, since, for the world as a whole, the flow of trade may be measured either as it leaves the various countries or as it enters them, but not both. Value of total imports is given above because imports are valued at market prices in receiving country plus shipping expenses, while exports are valued in home markets before shipment. Import values are thus more inclusive.

In order to get a clear picture of the chief cause for the exchange of goods and services between countries, it is only necessary to remember that, even within the United States, various sections tend to specialize in their economic pursuits. Food is provided principally by certain areas; coal, iron, petroleum and other minerals, chiefly by other sections; and cotton and forest products by still others. Manufacturing is done mainly in the cities, and pleasure resorts are found mostly in the mountains, on lakes and on the seacoasts. Between these different sections flows a continuous stream of commerce. Similarly, each of the countries of the world can produce certain commodities and services with relatively greater ease than other countries. The ability of a country to produce any given commodity, however, is relatively, not absolutely, measured. For example, the United States might be able to produce both rubber and automobiles cheaper than the East Indies, but if rubber were produced only slightly cheaper in

the United States than in the East Indies, while automobiles were produced at very much less cost, the United States would forego its slight advantage in the production of rubber in order to make the most of its greater advantage in the production of automobiles. As a result, the East Indies would devote themselves to the production of rubber, the United States to the production of automobiles, and an exchange of automobiles for rubber would occur between them. This is in accordance with what is known as the principle of comparative costs and presupposes no tariff restrictions or other barriers to the free flow of trade across international boundaries.

World trade is thus fundamentally an exchange of foods, raw materials and manufactured products between the countries of the world, each of which uses the articles that are easily produced within its borders to purchase necessary and desirable things, not obtainable within its borders, from other parts of the world.

The natural resources, the human resources and the stage of economic development of a country determine the nature of the things it exports and imports. International markets are highly competitive, however, and in order that the export industries of the country may hold their share of the world trade, they must be able to compete with those of foreign countries in the following respects: control of supplies, as extensive as possible, of raw materials,—the nearer to a monopoly, the better; cheapness in price, all shipping expenses and tariff duties included; pre-eminence in quality; ability to extend credit on favorable terms to buyers; government aid to exporters in the way of expert advice, collection of trade statistics, protection of property, laws facilitating exports, and even financial subsidy; and a knowledge of, and deference to, the language, laws, customs, traditions and manner of living of the foreign peoples with whom they deal.

Governmental supervision over exports is in general for the purpose of ensuring that no goods are exported contrary to public policy, especially in time of war, and of compiling foreign trade statistics. Governmental supervision over imports is undertaken for the purpose of raising revenue and for the purpose of protecting the well-being of the country's people and industries.

In 1821, the United States exported relatively few finished manufactures but imported a great many; the lapse of a century has brought a significant change, since the country in 1938 was in an advanced stage of economic

development, its main class of exports was finished manufactures and its most important class of imports was crude materials to be worked up by home industries. The five leading articles exported from the United States are raw cotton, petroleum and its products, machinery, automobiles, including parts and accessories, and iron and steel products. The five leading articles of import in 1937 were crude rubber, coffee, cane sugar, paper, including paper manufactures, and vegetable oils. The great shift, in recent years, in the balance of trade (excess of exports over imports), is shown in the article on TRADE.

For current export and import statistics, consult *Monthly Summary of Foreign Commerce of the United States*; *Statistical Abstract of the United States*; *Commerce Yearbook*; and numerous trade information bulletins,—all published by the United States Department of Commerce. For statistics of foreign countries for recent years see *Memorandum of International Trade and Balances of Payment*, published by the League of Nations.

Expositions. See **Exhibitions.**

Express Companies, originally companies organized to conduct a service for the expedited delivery of goods or money, performing functions in this respect additional to those performed by railroads, steamship lines and other common carriers. Today, the express services are conducted by the railroads themselves by means of an organization known as the Railway Express Agency, the individual companies which originally carried on the express business having either dissolved or changed in character.

Express service differs from railroad freight service particularly with respect to its much greater expedition, its complete pick-up and delivery functions and the parcel rather than bulk character of the greater part of the shipments. Express traffic, however, is of the widest variety. It includes money, securities, all varieties of commodities, race horses and a great volume of perishable freight requiring unusually prompt delivery. The bulk of the medium or long distance express traffic is carried in cars moving in fast passenger trains. Between many important business centers exclusively express service trains are operated, such trains moving on the equivalent of fast passenger schedules. Motor trucks, steamship lines and now the airplane are also extensively used.

The express system dates back to 1839 when William Harnden undertook to handle packages and documents between New York and

Boston and to execute commissions for the merchants of the two cities. Ready demand for the service soon led to the formation of many companies which, by 1914, had been reduced by consolidations to seven in number, namely: the Adams, American, Wells Fargo, Southern, Great Northern, Western and Northern. Each of the seven companies, speaking generally, tended to have a territory of its own; each company operated under contract with the individual railroads over the lines of which it conducted service. Usually, the railroad company gave the express company a monopoly of the express business over its line and provided free transportation for the express company's officers and employees and for express company property and supplies. For compensation, the express company, in most instances, paid the railroad company a percentage of the gross receipts from the traffic. The company assumed all risk of loss or damage to property or persons and carried free of charge all money or packages pertaining to the business of the railroad.

The status of the express companies was radically changed in 1918 when the railroads were placed under Federal control as part of the government's war program. The individual express companies were asked to form a single corporation. Accordingly, such a new corporation was created under the name American Railway Express Company, which continued with some changes, such as the establishment of the Southeastern Express Company, until 1929.

In 1929, the railroads organized a new company known as the Railway Express Agency, which meant that the railroads themselves then took over a service they were believed well able themselves to perform without the intrusion of an outside agency. It was expected that the Railway Express Agency, acting for the railroads as a whole, would co-ordinate the elaborate express services while saving the costs of duplication of pick-up and delivery services.

The express companies were not subject to public regulation until they were placed under the regulation of the Interstate Commerce Commission in 1913, by the Hepburn Law. This law was followed by the publication of an order of the Interstate Commerce Commission, based on an investigation extending over three years, and including the hearing of arguments on every side of the question. By this order rates are fixed by dividing the country into five zones, according to density of population and expense of transportation, and by

subdividing these zones into blocks. The rate between any point in one block to any point in another block is made clear by a series of tables. Consult Johnson and Van Metre's *Principles of Railroad Transportation* (1916); and decisions of the Interstate Commerce Commission, Vol. 59, and decision dated February 11, 1929.

Expunging Resolution, a resolution passed by the U. S. Senate, Jan. 16, 1837, directing the expunging of the previous resolution of that body (passed Mar. 28, 1834) censuring President Jackson for ceasing to use the U. S. Bank as depository of public moneys. The expunging resolution recited that the resolution of censure 'was not warranted by the Constitution, and was irregularly and illegally adopted by the Senate,' 'and was of evil example and dangerous precedent.'

Extent, a common-law writ of execution, by which defendant's body, goods and lands can all be taken at once to satisfy the judgment. The writ is so named because the sheriff causes lands seized to be appraised at their full extended value.

Extenuating Circumstances, facts which may be taken into account in mitigation of punishment, such as youth, previous good character, great temptation, provocation, or that the offender acted under the influence of others.

Extortion, in law, obtaining money or property from a person against his will, by threats or unlawful force, by an officer of the law under the pretence of having the right to do so by virtue of his office.

Extracts, solutions containing one or more substances that have been removed from admixture with others by means of a solvent or menstruum. The solvents most commonly used are water, alcohol, ether, and acetic acid. Extraction is much used in pharmacy, as extracts usually contain a larger proportion of the active principles than the original substance, and they can also be dispensed in a more convenient, palatable, or active condition.

Extradition, the surrender by one nation or state to another of a person accused or convicted of crime committed within the jurisdiction of the latter. International extradition is that between independent nations. Whether international law makes extradition a legal duty has been the subject of dispute, the great weight of authority being that it is merely a moral obligation based on comity. Within the past one hundred years most nations have recognized that the general welfare was promoted by the punishment of criminals, and

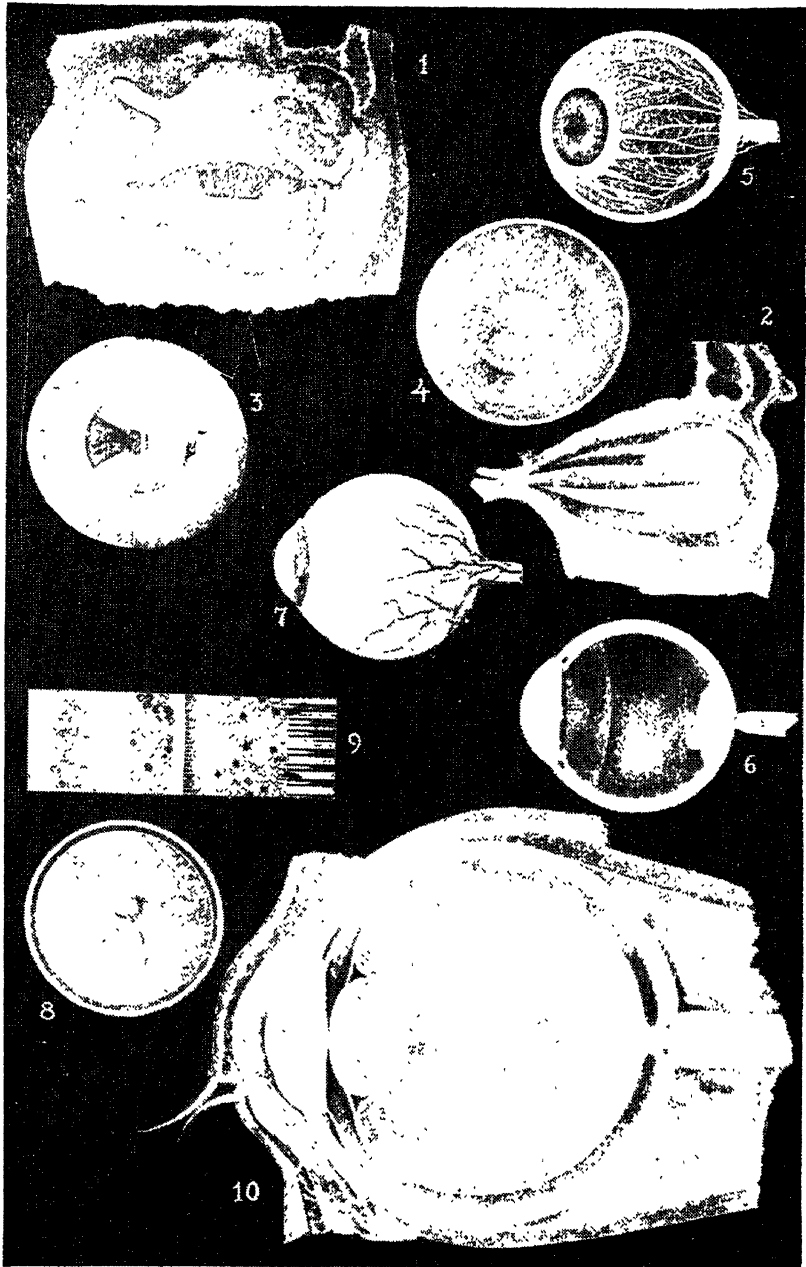
that it was disadvantageous for a country to be an asylum for wrongdoers, so that many treaties providing for extradition have been made.

Jay's Treaty of 1794 between the United States and Great Britain provided for extradition in case of murder and forgery, but was operative only for the period of twelve years. It was followed by the Ashburton Treaty of 1842, which added as extraditable crimes assault with intent to murder, piracy, arson, robbery, and utterance of forged paper. This treaty was held not to require extradition for manslaughter, and it contained no provision for burglary, larceny, rape, embezzlement, and other serious offences, so that Canada was a safe harbor for many offenders until 1889, when a treaty was concluded covering all of these offences, and in addition counterfeiting, receiving stolen property, criminal fraud by bailee, agent or director of a company, perjury or subornation thereof, abduction, kidnapping, revolt on a ship and offences against laws as to slavery. In 1900 obtaining money by false pretences, wilful obstruction of railroads and procuring abortion were added. The treaty between the United States and Mexico is broad, adding mayhem to the usual extraditable crimes, Mexico being, with the Netherlands, the only country to provide with the United States for extradition in case of bribery. The treaty with Mexico does not include perjury. Extradition treaties are in force between the United States and more than 40 other countries.

A United States judge or commissioner may, upon complaint under oath, arrest the alleged fugitive from justice, and, if evidence which would warrant an ordinary commitment is given, the magistrate so certifies to the Secretary of State, who, upon the requisition of the foreign government concerned, issues a warrant for the surrender of the fugitive. If the magistrate has no jurisdiction, or if the offence charged is not within the treaty, or there is no evidence of criminality, the court will release the fugitive upon habeas corpus proceedings. The States have no jurisdiction over international extradition.

Usually citizens of the country of asylum will not be surrendered, and provision is ordinarily made that the fugitive shall not be tried for any offence other than that for which he was extradited until after he has had an opportunity to return to the country surrendering him.

Interstate extradition is provided for in the Constitution of the United States. 'A person



1. Microscopic views of the upper and lower eyelids showing tear glands. 2. Eyeball enclosed within its socket showing attachments of outer muscles. 3. Cross-section of anterior part of eyeball. 4. Pupil—Iris. 5. Muscles and outer coats removed, showing eyeball structure. 6. Longitudinal cross-section of eyeball. 7. Enucleated eyeball. 8. Macula Fovea. 9. Microscopic view of part of retina. 10. Cross-section view of eyeball.

charged in any State with treason, felony or other crime, who shall flee from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up to be removed to the State having jurisdiction of the crime.

Extra-Territoriality, the immunity which under certain circumstances members of a foreign state enjoy in a foreign land. It applies to kings, ambassadors, armies, and ships of war. Sovereigns, if not incognito, are not subject to the civil or criminal jurisdiction of a foreign country, unless they choose to submit to it and this same applies to their attendants. The only remedy against a criminal sovereign is to expel him.

The question of extraterritoriality is particularly concerned with the status of Western peoples in Far Eastern countries, notably China, Siam, Persia, Turkey, and Morocco. Extraterritoriality privileges have been secured by treaty. In China the Western powers first demanded extraterritoriality because of certain objectionable features of the penal code. In a treaty signed with China Jan. 11, 1943 the U. S. renounced its extraterritoriality rights.

Extravasation, a term used for the escape of any body fluid from its proper vessel. Extravasation of blood results from rupture of the vessel walls and may be produced by crushing or may occur as a result of disease. Extravasation of urine follows rupture of the kidney, ureter, or bladder, from a crush or a blow; fracture of the pelvis is a common cause. Similar organic injuries may produce extravasation of bile, cerebrospinal fluid, lymph, aqueous humor, etc.

Extreme Unction, the last rite of the Roman Catholic Church which is believed to impart to the Christian in death strength to encounter the ordeal of the dying hour. The word 'extreme' signifies that this particular anointing is reserved for cases in which immediate death is apprehended.

Exumas, Great and Little, two of the Bahama Islands, West Indies. The larger is 30 m long and 3 m broad. Little Exuma has an excellent harbor.

Eyck, Hubert (c. 1370-1426), **Jan van** (c. 1390-1440), and **Margaret** (?1377-1430), brothers and sister, eminent artists, and founders of the Early Flemish school. Tradition credits them with the invention of the art of painting in oils, but they certainly were the first to perfect the mode of mixing colors. Their pictures are famed for their beauty. See Lalaing's *Jean van Eyck* (1887), and Kämmerer's *Hubert und Jean van Eyck* (1898).

Eye. In cyclostomes the eye is simple and degenerate, and in Amphioxus the eye of other chordates is represented merely by a pigment spot. As regards fishes, the modifications present may for the most part be directly associated with the aquatic life. No very important modifications of optic structure are observable in amphibians or reptiles, but in birds the eyes are large, and elongated in the antero-posterior direction.

In mammals generally the eye presents the same appearances as in man, except that in aquatic forms, such as the Cetacea, the cornea tends to take on the flattened form seen in fishes. The common statement that the cat-like carnivores can see in absolute darkness is of course incorrect. In invertebrates the eye shows an extraordinary range of variation. It may in the simpler forms be little more than a pigment spot, while in the cuttles it reaches a complexity which can only be compared to that of the vertebrate eye. Among arthropods the eyes are of the type known as compound—that is to say, the eye consists of a large number of eye elements, each made up of a transparent cornea, a transparent rod known as the crystalline cone, and a cluster of percipient elements constituting the retinula, which are connected with the fibrils of the optic nerve. Many arthropods possess, in addition to their compound eyes, simple eyes of a much less specialized nature.

In man each eye moves in an orbit, or bony socket, pyramidal in shape, and so placed that lines produced backward through the centers of both orbits would meet behind the nose. In these bony sockets the eyes (eyeballs) are moved by various attached muscles, those for both working harmoniously together, so that the normal eye always moves with its fellow for precisely the same distance and at the same rate. Should this not be the case, then a divergent or convergent squint is the result. Behind, it is connected with the brain by the optic nerve, which passes through the back of the pyramidal orbit. Each eye has two eyelids or thin movable folds of skin, which cover loose tissue, cartilage, muscle-fibers, blood-vessels, etc., the under or inner surface being lined with conjunctival membrane. The eyelids help to protect the eye from exposure to light, dust, etc. Tears are constantly being secreted from the lachrymal gland, which lies at the outer angle of each eye, slightly above it. The tears pass on to the surface of the eye, through the lachrymal ducts and the action of the lids keeps them constantly flowing towards the inner angle at the nose, carrying with them anything, such as dust, which has

fallen on the eye. At the side of the nose the tears enter two canaliculi (little canals), which join at the lachrymal sac, and the canal then runs directly downward, becoming the nasal duct, through which tears are always flowing into the interior of the nose. The edges of the lids show the eyelashes, which serve as screens, preventing large quantities of dust from entering the eye, even when the lids are apart. Under the edges of the lids are rows of Meibomian glands, opening by ducts, and secreting a sebaceous material which prevents the lids from adhering to each other. The movement of the lids is largely reflex.

The eyeball is commonly described as a globe, made up of two segments from a larger and smaller sphere. The smaller segment is to the front, and consists of cornea, covered by mucous membrane (conjunctiva), aqueous humor, and iris. The larger segment, lying behind the smaller, consists (from without inwards) of sclerotic (covered on the front part by conjunctiva), choroid, and retina—three layers or coats of different thickness, structure, and function. The space they enclose holds the vitreous humor, in the front of which lies the crystalline lens, immediately behind the pupil, which is the circular black opening, sometimes dilated, sometimes contracted, in the middle of the iris. On the degree of contraction of the iris the size of the pupil depends. It is the color of the iris which makes an eye blue, or gray, or brown. There is no such thing as a black eye, so far as the iris is concerned. If the pupil or central opening is large then the eye has a darker appearance, and some pupils are usually more dilated than others. The light passes through both conjunctiva and cornea, then through the aqueous humor, lying in the pupillary space, next through the crystalline lens, behind that space, and finally through the vitreous humor, to fall on the sensitive lining of the eye, the retina. Everything that lies before the retina is transparent. Hence by throwing a strong light on the center of the eye you can look through the pupil and examine the retina, which shows as a pink surface, with darker red lines wandering over it. These are blood-vessels. Rays of light do not produce the image of an object until they fall upon the retina. It receives the impression and transmits it to the brain through the optic nerve. It is a very thin, yellowish-gray membrane, as seen when the eye is cut open. Relatively the most essential parts of the retina are the rods and cones. At the center is the yellow spot, which seems to have an acuter vision

than any other part of the retina. The optic nerve, which pierces the sclerotic, choroid, and retina, appears not quite in the center, as the 'blind spot.' An artery reaches the inside of the eye through this 'blind spot.' The crystalline lens, lying in the pupil immediately behind the iris, is attached to the choroid by a circular ligament. The lens is transparent, convex before and behind, the convexity tending to decrease with age as elasticity is lost. Accommodation of the eye to objects at short or long distances is produced by altering the convexity of the lens, through the ciliary muscles, which makes taut or loose the suspensory ligament.

Eyebright, small European annual plant belonging to the Scrophulariaceæ. It bears in early autumn numerous white or purplish flowers in the axils of the leaves. It is especially common near the sea. It has a bitter taste, and was formerly much used as a remedy for diseases of the eye.

Eyra, a small American cat, about the size of the domestic cat, but remarkable for the elongation of the body, which resembles that of a weasel, and for the uniform, reddish, unspotted coloration. It inhabits the e. region of South America, and northwards to Texas.

Eyre, Edward John (1815-1901), English governor of Jamaica, born in England. In consequence of the stern measures which he took to suppress a rebellion in Jamaica, October, 1865, he was superseded, and prosecuted at the instigation of a committee presided over by John Stuart Mill. He was acquitted.

Eyston, George E. T., British auto racer; drove world's record land mile at 357.5 miles per hour, 1938, at Bonneville, Utah.

Ezekiel, a Hebrew prophet, was one of the temple priests deported to Babylon by Nebuchadnezzar, 597 B.C. Ezekiel received the prophetic call in the 5th year of his exile, and his message at first consisted largely of denunciations of his countrymen both in Babylon and Palestine; but after the fall of Jerusalem, in 586 B.C., he became a prophet of consolation, promising the eventual deliverance and restoration of the chosen people. Ezekiel developed the doctrine of individual responsibility (ch. 18), and of the Messianic kingdom, as no prophet before him. His style is not of the highest order, but is extraordinarily rich and striking in its imagery. The authenticity of the book is admitted all but universally, but the corrupt state of the Hebrew text is no-

torious. See commentaries by Skinner in *Expositor's Bible* (1895), Bertholet (1897).

Ezekiel, Moses [Jacob] (1844-1917), American sculptor. He studied sculpture at the Royal Academy in Berlin (1869), where his colossal bust of Washington gained him admission to the Society of Artists, and where he took the Michael Beer prize, then first won by a foreigner. Among his most important sculptures are *Religious Liberty* (in Fairmount Park, Philadelphia), *Apollo and Mercury* (in Berlin), *Christ in the Tomb*, *Judith* (in the Cincinnati Museum), and the *Jefferson Monument* at Louisville, Ky. His work is characterized by great technical skill in the carving, and he was the first to introduce the German and new Italian styles of sculpture to this country.

Ezra, 'the scribe,' was one of the Jewish captives in Babylon under Artaxerxes I. (Longimanus). In 458 B.C. he obtained an edict empowering him to conduct a band of fellow-exiles to Jerusalem, and to reorganize the community there on the basis of the law. Jewish tradition makes him the restorer of all

the pre-exilic literature, which is alleged to have been destroyed at the fall of Jerusalem.

Ezra and Nehemiah, The Books of. These formed originally a single document, both in the Jewish and Christian canons, and are the continuation of the Books of Chronicles. They cover a period of over a hundred years, and deal with the return of the Jews from the exile and the organization of Judaism, but with large lacunæ, giving only a few outstanding features. They record the first return under Zerubbabel and the frustrated attempt to rebuild the temple; a renewed and successful endeavor with the authority of Darius; a second return under Ezra; Nehemiah's return and the construction of the wall of Jerusalem; the promulgation of the law by Ezra; a catalogue of Jewish families and priests; the dedication of the walls, the regulation of the temple services, and Nehemiah's second visit.

Ezra Church, or Ezra Chapel, Battle of, a battle of the Atlanta Campaign during the American Civil War, fought on July 28, 1864.

F

F

Fabian

F, the sixth letter in the English and Latin alphabets. The original symbol in the Egyptian hieroglyphs was the picture of a cerastes or horned asp; the horns being represented by the two horizontal bars in our F, and the body by the vertical stroke. When the Egyptian sign was adopted by the Phœnicians it received the name of *Vau*, from the resemblance to a nail or peg. From the Phœnicians it passed into the early Greek alphabet as a semi-vowel, but at some time previous to the oldest extant Greek inscriptions it was differentiated into two characters, one of which, **F**, had the sound of *w*, and the other, **V**, with the name *upsilon*, became a vowel. As early as the 7th century B.C. the character **F** became obsolete as a letter in the Eastern Greek alphabet, being retained only as the numeral for six. In the Western alphabet, which was used chiefly in the Peloponnesus, **F** was retained as a letter till the 5th century B.C. From the Chalcidian alphabet it was transmitted to Italy, retaining its position as the sixth letter, but acquiring in Latin the sound of *f* instead of *v* or *w*. This sound *f* is called a labiodental fricative, and is formed by bringing the lower lip into contact with the upper teeth. **F**, in music, is the fourth tone of the natural scale of **C**. It is the chemical symbol for fluorine.

F., **Fahr.**, abbreviations for 'Fahrenheit.'
f. and **ff.**, abbreviations for 'following,' and (in music) 'loudly,' 'very loudly.'

Faber, Frederick William (1814-63), English theologian and hymn writer, followed the example of his master, Newman, and went over to the Roman Catholic Church. He published a *Life of St. Wilfrid* in 1844, founded a community at Birmingham, and published a number of theological works, but is best remembered by his hymns, *O Paradise, O Paradise; O Saviour, bless us ere we go; Pilgrims of the Night*, and others.

Faber, John, the elder (?1660-1721), English draughtsman, a native of The Hague, set up a print shop in London, and practised as a mezzotint engraver. He is noted chiefly for his pen portraits on vellum and his engravings,

of which those of the founders of the Oxford and Cambridge colleges are best known. His more famous son, **JOHN FABER** the younger (?1695-1756), is noted for mezzotint engravings of historical and domestic subjects, and his portraits.

Fabia Gens, a patrician house of ancient Rome. The most famous of its members were as follows: **CAESIO FABIVS VIBULANVS** was consul in 484, 481, and 479 B.C. **QUINTVS FABIVS MAXIMVS RULLIANVS**, consul six times between 322 and 295 B.C., was the greatest Roman general in the Second Samnite War. **Q. FABIVS MAXIMVS**, variously nicknamed *Cunctator*, or the 'Delayer,' *Verrucosus*, 'warty,' and *Ovicula*, 'sheep,' from the mildness of his temper, was consul in the years 233, 228, 215, 214, and 209 B.C., censor in 230, and dictator in 221 and 217. He was generally regarded as the saviour of Rome in the war against Hannibal. **Q. FABIVS PICTOR**, who served in the Gallic War (225 B.C.), and also in the Second Punic War, is the earliest prose historian of Rome.

Fabian Society, an English socialist organization founded in 1884. It was started in London by a small group of people under the leadership of Thomas Davidson, an American, who was interested in social progress. The founders repudiated all violent and sudden methods of propagandism, and it has labored principally through lectures and tracts, some of which have exerted a wide influence. Its members have done much to promote there and in other cities what is known as 'municipal socialism.'

The Fabian Society aims at the reorganization of society by the emancipation of land and industrial capital from individual and class ownership and the vesting of them in the community for the general benefit. For the attainment of these ends it looks to the spread of Socialist opinions by the dissemination of knowledge as to the relation between the individual and society. Among the more notable of its publications are *The Workmen's Compensation Act*, *The Case for State Pensions in Old Age*, *Women and the Factory Acts*, *Capital*

and Land, Facts for Socialists, and The Fabian Essays. It also issues a useful bibliography of social economics, entitled *What to Read*.

Fable (Lat. *fabula*, 'a story'), a moral apologue or parable of a more or less humorous kind, in which the actors and speakers are usually animals, though plants and occasionally human beings may appear among the characters. Of genuine fables the greater number are associated with the name of Æsop, though the ultimate source of most fables is eastern folklore, the Brahmanistic beast fables and the Buddhist birth-stories which had long before been gradually finding their way westward through Arab or still more obscure channels.

The best and most original examples, whether in French or Latin, are often to be found in the works of the moralists, the preachers, and even the historians. From the 12th century there were often inserted in sermons *Exempla*, or short tales, sometimes edifying in themselves, sometimes having the character of parables or even merry stories, from which a moral was extorted. The greatest of modern fabulists was La Fontaine. Rostand's *Chantecler* and Maeterlinck's *The Blue Bird* are fables in dramatic form. See ÆSOP; HITOPADESA; REYNARD THE FOX.

Fabliaux, short satirical verse tales of old France, full of a spirit of mischievous and free-spoken jollity. Two hundred or so are in existence, dating between the end of the 12th and the end of the 14th century, and belonging chiefly to Picardy, Normandy, and the Isle of France. In Italy they took a prose form, as in Boccaccio's *Decameron*. In England, Chaucer wrote what are really *fabliaux*, but with greater poetical genius and less coarseness.

Fabre, Ferdinand (1830-98), French novelist. He produced his first novel, *Les Courvoisier*, in 1862, and followed this by others dealing principally with the country life and manners of Hérault, and introducing descriptions of priestly life charming in their simplicity and truth. Fabre's principal novels are *Le Chevrier* (1868), *L'Abbé Tigrane* (1875), *Mon oncle Célestin* (1881), and *Lucifer* (1884). Consult his *Ma vocation* (1889) and *Ma jeunesse* (1903).

Fabre, Jean Henri (1823-1915), French entomologist. The English translations *Insect Life* (1901), *Life and Love of the Insect* (1911), *The Life of the Spider* (1913), *The Life of the Fly* (1913), *The Mason Bees* (1914), *The Hunting Wasps* (1915), and *Our Humble Helpers* (1918), are all taken from the great *Souvenirs entomologiques* (10 vols. 1879-1907). His writ-

ings have exerted great influence in popularizing the study of insect life.

Fabrizio, Gentile di Niccolo di Giovanni Massi da, called GENTILE DA FABRIANO (1360-1428), Italian painter; first great master of the Umbrian school. In Florence he painted for the church of the Trinità his chief work, *The Adoration of the Kings*, 1423 (Academy, Florence). He had a fine sense of color and feeling for beauty, and delighted in expressing the mediæval ideal of terrestrial happiness by decorating his panels with embossed and incised gold, his foregrounds with exquisite flowers, his figures with jewelled trappings.

Fabricius, (full name, GAUUS FABRICIUS LUSCINUS) was probably a settler in Rome from the Hernician town of Aletrina. As consul he gained great victories over the Lucanians, Bruttians, and Samnites (282 B.C.). In 275 he was censor, and distinguished himself by his stern repression of luxury.

Fabricius, Johannes Albertus (1668-1736), German classical scholar. He is regarded as the founder of the history of classical literature. His most celebrated works are *Bibliotheca Latina* (1697), *Bibliotheca Græca* (14 vols., 1705-28), *Bibliographia Antiquaria* (1713), *Bibliotheca Ecclesiastica* (1718), and *Bibliotheca Latina Mediæ et Infimæ Ætatis* (1734).

Fabrics, Textile. The word textile is applied to all woven fabrics, whether plain or ornamented. The most simple form is that in which the threads cross at right angles, passing over and under each other in regular order, and a great variety of goods are thus made. By the use of variously colored threads, checks and stripes are produced, as in the plaids of the Scottish clans. By the use of threads of varying thickness a corded effect is obtained, as shown in articles of the *repp* order. *Crepe* is made by using hard twisted threads, so that the cloth, when taken out of the loom, shrinks or puckers. With softly twisted woolen yarns and loose weaving the goods can be milled, or felted into a firm texture, as in the case of broadcloth. Teasing up of the fibers produces a hairy surface, in imitation of the skin of animals, such as is seen in some blankets. Perhaps the most important development of a plain 'weave' is the production of *pile* fabrics. These are woven with two warps, one of which is looped over transverse wires, and stands out above the main body of the cloth; when these loops remain uncut the cloth is named *terry*, in carpets *Brussels*. When the loops are cut so as to form a brushlike surface *velvet* is the result; in carpets a similar treatment is

known as *Wilton*. The variety of fabrics may be further increased by altering the weave.

Historically, textile fabrics are of ancient date. In the book of Exodus we read of 'the cunning workman, and of the embroiderer, in blue, and in purple, in scarlet, and in fine linen, and of the weaver.' Sufficient fragments have been found to prove that in skill of work and beauty of design the Greeks, Romans, Egyptians, Assyrians, Persians, Sicilians, were far advanced at an early period. Silk was used in China two thousand years B.C. In the 14th century the art of weaving reached its highest point: witness the tapestries at Coventry, representing the marriage of Henry VI. In the 17th and 18th centuries Gobelins and Beauvais tapestries became famous. William Morris says: 'There are several ways of ornamenting a cloth—real tapestry, carpet weaving, mechanical weaving, printing or painting, and embroidery. There has been no improvement (indeed, as to the main processes, no change) in the manufacture of the wares in all these branches since the 14th century.' With this belief Morris strove to awaken the interest in textile fabrics, and exquisite work came from his looms. See his lecture on Textiles in *Arts and Crafts Essays* (1899). Ashenhurst's *Weaving and Designing of Textile Fabrics* (5th ed. 1893); Beaumont's *Woolen and Worsted Cloth Manufacture* (3d ed. 1899); Taylor's *Cotton Weaving and Designing* (1893); Matthews, *Textile Fabrics* (1904).

Fabroni, Angelo (1732-1803), Italian biographer. Conscientious and reliable, he has been well called the 'Plutarch of Modern Italy.' He published in 1778-1805 *Vita Italorum Doctrina Excellentium* in twenty volumes. Among his most famous biographies are those of *Cosmo de' Medici*, *Lorenzo de' Medici*, and *Leo X.*

F A C A, Federal Alcohol Control Administration. A U. S. New Deal agency.

Façade, the name applied to the front of a building. In the 13th century it was adopted as a complete design, being found in secular and in ecclesiastical architecture. In the latter case it usually signifies the principal or west front. The typical Italian façade is pedimented.

Facial Angle, a craniometrical expression, denoting the angle between the facial line (a line drawn downward from the forehead to the nostrils) and another line drawn horizontally from the nostrils to the ear. In general, the more acute this angle the lower is the type. The ideal Greek face indicates a right angle as the facial angle.

Factor. 1. In arithmetic, where numbers are multiplied together, the resulting figure is called the product, and each of the numbers multiplied is said to be a 'factor' of the product. A factor which cannot be divided without remainder by any number except itself and unity is called a 'prime factor.' 2. A special kind of agent for the sale of merchandise on commission. He is given possession of the goods which he is to sell, and delivers them to the purchaser after effecting the sale. In the United States, agents of this kind are more frequently known as commission merchants, but the rules of law applicable to their business are the same.

Factors Acts. The name applied to statutes in the United States and England, enacted for the protection of persons dealing with factors or agents having possession of goods for sale. Under these acts, if a factor sells or pledges the goods in his hands to an innocent person, in violation of his principal's instructions, the transaction is valid as against the latter.

Factory Acts. Wherever the factory system has been introduced it has been almost invariably attended by conditions within factories which have proved harmful to those employed therein. Consequently it has been found necessary to enact laws for the protection of the worker, known as 'Factory Acts.'

The first laws which may properly be called 'Factory Laws' were enacted in England early in the 19th century. They were enacted primarily for the protection of children through the regulation of the terms of apprenticeship and the insuring of the humanitarian treatment of the juvenile workers. Then followed laws limiting the length of the working days for women and children, and providing for sanitary conditions and sanitary conveniences, proper ventilation, safeguarding of machinery and prevention of accidents, and numerous other matters affecting the health and comfort of employees; so that the range of factory legislation now covers nearly all conditions of industrial employment. More recently, the protective measures have had reference to occupational diseases, resulting from exposure to poisons, gases, fumes, etc.

The degree of protection afforded to workers in factories is determined not merely by the number of laws passed in their behalf, but also by the administrative provisions for the effective enforcement of these laws; and it is to this phase of legislation that attention is being urgently directed at present.

In England, testimony before the Man-

chester Commission of 1796 disclosed much misery, especially among minors, resulting from oppressive factory conditions. The first factory act was passed in 1802, through the efforts of the elder Sir Robert Peel. By the provisions of this act the hours of apprentices were limited to twelve a day; their employment at night was to be gradually discontinued, and to cease entirely in 1804; and employers were required to provide for the proper care and instruction of the apprentices, and for separate sleeping apartments for the sexes.

It was not until 1819 that an act was passed which prohibited the employment of children under nine years of age; provided that children between nine and sixteen years of age should not be employed more than twelve hours daily, or between 8 P.M. and 5 A.M.; and placed other restrictions on their employment, numerous exceptions being made in the case of mills driven by water power. The next act registering distinct advance in the extension of the principle of child labor legislation was that of 1833. By the Act of 1844, the first attempt was made to provide against accidents by prohibiting the cleaning of moving machinery by children. In 1847 an act provided a ten-hour day for women and children. In 1864 the definition of 'factory' was widened in scope so as to include 'any place where persons work for hire.' Improvements have been made in factory conditions from time to time since, especially in matters of sanitation.

In 1839 the first Prussian child labor law prohibited the employment of children under nine years of age in factories, mines, and metallurgical establishments; limited the maximum working day for employees under sixteen years of age to ten hours; prohibited their employment at night and on Sundays and holidays; and contained other important features of modern factory acts.

The first act in France with specific reference to the conditions of labor in factories was passed in 1841. This law, entitled 'An act in relation to the employment of children in factories, mills, and workshops,' was an advanced measure for that period. It embraced, in principle at least, most of the features contained in modern factory legislation; but it was poorly enforced, and with the exception of one or two departments, its provisions were almost wholly disregarded, until 1883, when a law was passed making its enforcement a part of the duties of the factory inspectors.

In the United States the first real factory act was that of Massachusetts in 1842, which provided that 'no child under the age of twelve

years shall be employed in laboring in any manufacturing establishment more than ten hours in any one day.' Its importance consisted chiefly in the fact that it was the initial measure of its kind, and established in the United States precedent for further protective legislation in the interest of employees. With the exception of a few provisions limiting the hours of labor for women and children, no important legislation of this character was passed until after the close of the Civil War.

In 1866 Massachusetts enacted a child labor law which prohibited employment in any manufacturing establishment of any child under ten years of age, and further provided that no child under fourteen years of age should be employed in any manufacturing establishment more than eight hours in any one day. An act in 1867 provided that no child under the age of fifteen years should be employed in any manufacturing or mechanical establishment more than sixty hours in one week. In 1869 the Massachusetts Bureau of Statistics of Labor (now styled the Bureau of Statistics) was established, which served as a prototype for similar bureaus in many other States. In 1874 a law was enacted limiting to ten hours the labor of young persons (under eighteen) and women, this being the first American law restricting the hours of labor of women. In 1877, in the same State, provision was made for factory inspection. Thus for a long series of years Massachusetts took the leadership in enacting laws for the protection and safety of employees.

The Federal Government and nearly every State and Territory have passed legislation regulating the conditions of labor; but for the most part the factory acts, strictly so called, are confined to those States in which the manufacturing industries are important. The passing of legislation of this character, except where it concerns interstate commerce and Federal employment, has remained, under the Federal Constitution, a function of the several States; consequently, for many years there was a great lack of uniformity in the statutes passed, and even at the present time in certain phases of labor legislation there has been apparently little effort made to secure uniformity. Furthermore, many acts passed by State legislatures in this country have been declared unconstitutional by the State or Federal Courts, and therefore, in order to accomplish similar ends, various methods of securing protective legislation have been devised in the several States. A survey of the factory legislation now in effect in the several States shows that

the more advanced statutes in one State have frequently been taken as models, and enacted with but minor changes in phraseology, in other States. It is of interest to note that Massachusetts, New York, Wisconsin, and Illinois have furnished a large number of 'model acts' of this character.

In New York the Consolidated Labor Law of 1909, since amended in certain respects, covers a wide range of protective measures of which the provisions relative to inspection of factory workshops and other premises where wage earners are employed are probably as comprehensive as any of this character now in effect in the United States.

More recently emergency relief acts and workmen's compensation have been subjects of discussions and various states have amended laws in these matters.

Federal child labor laws have been declared unconstitutional, Congress in 1924 submitted to the states a proposed constitutional amendment to enable Congress to regulate and prohibit the labor of persons under 18 years of age. By 1939 this had been ratified by but 28 of the 36 required states.

Among New Deal legislation bearing on factory employment were the Social Security Act, the National Labor Relations Act and the Fair Labor Standards Act, each of which imposed a heavy burden on industry without proving of great benefit to labor. The former provides old age and unemployment insurance, the second gives workers the right to organize, and the latter sets limits for wages and hours.

During the early development of manufacturing in Australasia the factory regulations adopted followed closely in character those of England, but in later years the colonies displayed marked individuality in the matter of factory legislation and at the present time, no part of the world has more thorough and comprehensive legislation. See LABOR LEGISLATION; CHILD LABOR; SAFETY, INDUSTRIAL.

Factory Organization and Management.—Factory organization and management are only the form and method of control assumed by one part of our economic system, whereby the production of manufactured articles may be carried on with the greatest efficiency within the established order of the larger social organization. Not until we understand the greater forces controlling our social organization can we comprehend the meaning of our factory organization and mark out its limitations.

When, in the 18th century, LaPlace pro-

pounded his theory of the universe as a system held together, and controlled by the *balancing* of great natural forces, he furnished a basis for a new theory of social organization. It was not long before men began to think of governmental control also in terms of the 'balance of power,' and statesmen began to adopt the theory of 'checks and balances' so well illustrated by the Federal Government of the United States.

It is perfectly natural that the organization and control of our economic life should follow also the course laid down by the prevailing philosophy of the time. Consequently, we find that a typical factory of to-day is organized according to the theory of checks and balances. To understand this, however, we must first see where 'factory organization' begins and 'corporate organization' leaves off.

The first step in building an organization is the *classification of activities* according to their general functions. This method is simplified if it is recognized that a business enterprise involves the two general activities of determining and directing corporation policies, and of supervising and operating the various divisions of production, accounting, and sales. By dividing the business activities of a corporation into these two general functions, the foundation is laid for a rational separation of the planners of policies, the supervisors, and the doers—furnishing at the same time a scale by which the various types of authority may be measured or gauged.

A *business policy* is an accepted line of procedure by which the activities of an enterprise are adjusted to one another harmoniously and efficiently.

An *operating function* is one which gets the work done either by directing an activity or by actually participating in any of the processes that make the goods, provide the system of administrative control, or carry out the necessary marketing and financing activities. With this distinction in mind, it is evident that the work of the superintendent of the factory, of the bookkeeper, or of the salesman would be classified automatically as an operating function of the organization. The term is usually confined, however, to the production part alone.

The term factory organization and management, in the narrower conception, applies to the methods by which the operative functions of a manufacturing concern are controlled by an organized system of *checks and balances*.

While details will vary from factory to factory, the goal which each strives to attain

among its various divisions and departments, is 'balance' in authority, in responsibility, and in accomplishment. An illustration of this is furnished in the balancing of the duties of a comptroller and of a general manager. The comptroller and the general manager are on the same level of authority. The relation of each to the president, the executive committee, and the board of directors is the same in value and expression. Each has a specific function to perform of equal importance to the company and in a sense each is a check upon the other. The general manager has charge of the physical condition and operative activities of the factory. The comptroller must provide records and the means for keeping track of production so as to show to the board of directors what results are being obtained by the general manager. In short the general manager is the predominating factor in matters pertaining to operation; the comptroller is supreme in matters of system and records.

Preliminary Procedure.—While it is not possible to treat of that part of factory organization which really precedes the starting of the machinery, it is well to indicate some of the important considerations precedent to actual productive operations. Capital, when once put into a manufacturing plant, becomes fixed. It cannot be withdrawn at will. It becomes necessary so far as possible to predetermine the success or failure of an enterprise; and by so doing offer protection to these large capital expenditures. The success of the business venture depends upon many conditions, but in general these will be covered by a consideration of the sources of raw material of manufacture, the sources of power, the market from which labor must be drawn, the market for the product, the physical surroundings, the transportation facilities, and, in some cases, the reorganization of existing plants.

The Plant.—Plants are usually built so that they can expand and still retain the principle of unity embodied in the small plant. The plan is to bring in the raw material and let it pass through the factory without doubling on itself during the successive processes of manufacture. In the layout of the plant the proper balancing of the various departments is essential. The machines in one department should not be so numerous as to produce more rapidly than the other departments can dispose of their product.

As the original location of the plant is largely a question of economical transportation, so the location of the machines within the plant is largely determined by transportation re-

quirements. Transportation facilities at the plant may be divided into external and internal. The buildings should be so arranged as to facilitate the bringing in and taking away of goods, while the internal layout should be such as to keep goods moving in one direction, and with as little handling as possible, in harmony with the outside transportation arrangement.

As the raw materials arrive by water, or other conveyance, they are taken into the storehouses, after which they pass through the various processes in the foundry, in the smithy, and in the carpenter shop. The products of the foundry and smithy meet in the machine shop, where the manufacturing processes are taken up with the same progressive movement toward the loading side of the plant. The machining processes completed, the product passes to the assembling room, where it meets the wooden parts all ready to be put together. Other processes here turn out the article completed and ready for the storehouse and shipment. The continuous forward movement without any retracing of steps, is the very basis of scientific organization.

Standard Equipment is another essential that must be provided for in the layout of a plant. By having standard machines of the same make in use, the cost of carrying repair parts is lessened and often much time is saved by avoiding shut-downs. The appointment of an expert purchasing agent before the factory is fitted out is almost as essential as planning the design of the floor space and transportation.

Conveyance of Internal Information.—Transportation is not confined to the conveying of materials alone. The question of carrying intelligence is one that must be solved, also. Messenger service is the commonest form in large concerns, although many firms use other means, such as the telephone and whistling tubes. One unique method is the blowing of a whistle, which can be heard all over a large plant. By a schedule of signals—one whistle for the manager, two for the foreman, etc., much time can be saved in calling these men when urgently wanted.

Departmental Divisions.—It is presumed that the incorporating of the business under State laws, the financing of the enterprise, and the duties of officers pertaining thereto have also been properly attended to. It is now necessary to determine upon what basis the electing and appointing of the various authorities shall be established so that the duties of each will correlate and work in harmony with the other. It should be done by a scientific di-

vision of authorities based on business functions.

The question of selecting men for positions of authority resolves itself to a discrimination between them according to their abilities to direct the activities pertaining to a particular business function. To make the proper division of a factory into departments, a chart displaying the geographical arrangement is often used. Another kind of chart is sometimes used by systematizers to display the various primary functions of the business and to show their connections. As we approach the actual operative functions by means of which goods are bought, made and sold, it is necessary to outline in still more detail the working of the factory.

The prime functions of a factory may be listed under twelve heads, each with its subdivisions: 1. *Controlling the Supply of Stock Used In Manufacturing* (raw material): a. A general central control (main office); b. Territorial control (branch or divisional offices); c. Local control (sub-companies). 2. *Purchasing Operating Materials and Supplies*: Buying, filling requisitions, etc. 3. *Testing*. The functions of testing are to establish standards according to which formal specifications or requirements are set to be met by suppliers or workers. 4. *Employing*.—This function embraces the general supervision of all matters pertaining to employees of the factory other than the direction of their productive activities. These matters embrace hiring, rating, etc. 5. *Selling*.—The function of selling embraces selling, ordering, advertising, etc. 6. *Storage*.—This function includes storing of parts and the finished goods. 7. *Transporting*.—This function pertains to the directing and the forwarding of goods. 8. *Maintenance*.—This covers the upkeep of the property, including repairs and renewals, both ordinary and extraordinary. 9. *Improvement*.—This department controls the replacing of existing buildings or equipment with improved types of greater relative efficiency. 10. *Construction*.—This covers the work of providing the factory with buildings and equipment to start with and then of providing properly constructed, arranged, and equipped buildings of various kinds as the business grows. 11. *Executive*.—The function of financing and planning the enterprise is given to the executive department. 12. *Administrative Departments*, including secretary, treasury, auditing, accounting, cost, statistical, real estate, and legal.

This outline lends itself to any number of

combinations; and new departures are constantly manifesting themselves.

Under functional management, which is an outgrowth of the 'Taylor System' of a planning department, the old type of foreman is superseded by eight men, each having his own special field to look after. These men act as agents of the planning department and as teachers in helping and directing the workmen.

The efficiency of the worker under functional management depends on five conditions: 1. The analysis of the elements of an operation; 2. careful selection of the worker; 3. the proper training of the employees; 4. proper tools and equipment; 5. an incentive to work.

A study of the various organizations belonging to The National Association of Corporation Schools will show that only a few of them have given the question of training employees the full consideration it deserves. The reason for this is evident although seldom expressed. Training touches the very heart of the employee relations of every kind. Corporations hesitate, therefore, to institute any new activity which may make these relationships any more unsettled than they are at present; for training not only creates greater efficiency but stimulates ambition for promotion; it develops the employee's interest in his work, but it also awakens a desire to know the next job as well; it creates the spirit to investigate one's own job, but it also awakens a curiosity concerning the balance sheet; it promotes loyalty to the firm, but it likewise stimulates a patriotic prejudice against unjust usurpations of the best positions by unworthy persons; it develops greater skill, but at the same time it opens the employee's mind to any disparity between his own growing capacity and that of his boss; it increases the employee's appreciation of his employer's efforts to promote the welfare of the organization, but it induces him also to measure his own influence in the determination of affairs (no matter how trivial) against the arbitrary commands of his superior. In short, when one sets out to liberate power he must provide the means for its control and direction. The increased labor power liberated through the use of improved machinery and the surplus energy which better working conditions release, and which the welfare work cultivates and the medical service conserves, are likely to be wasted unless the proper employee training accompanies the work of these splendid departments. Intellectual appreciation must accompany all improvements, whether they be in the way of better machinery, better working conditions,

or better moral environment. Training must keep pace with job analysis, it must follow close on the heels of welfare work, and suggestion systems, and be closely tied in with the manuals of procedure, holidays, safety devices, insurance methods and wage systems. In fact so long as public opinion—which, in the case of business corporations is employee opinion—is a fundamental and a controlling element in business organization and management, some means must be provided for adequate publicity and information involving company policies and operating details.

A study of labor problems shows that the problems which have arisen because of the division of labor into finer and ever finer distinctions between mental and manual work, are all fundamentally attached to the same underlying desire to produce on a large scale. These problems cannot be solved by such expedients as the experience of a shop foreman or a superintendent may be able to suggest. The highly complex problems involving the 'transfer of skill' or the 'transfer of ideas' call for the attention of specialists in the field of employee training. The problems of fatigue, lack of interest, lack of responsibility, and the like, demand the judgment of persons trained in the handling of men from the point of view of psychology and economics rather than men who are highly efficient in the practical application of the law of reduction of unit costs.

If, in addition, we consider the manifold employment problems that grow out of the interaction of men with the other administrative elements of machines, methods, etc.; producing the problems of labor turnover, strikes, sabotage, and the like, we feel justified in putting the determination of employment policies under the continuous consideration of an executive officer. He would propound policies before the executive bodies of the corporation with the same freedom and authority as the treasurer would discuss his problem of finance or the comptroller his question of organization and system, or the general manager his problems of production and sales.

So far as the personnel relations of employees is concerned, the work of selection, training, rewarding, promotion, and the like, may well be put under a superintendent of personnel who is on a level of authority with the factory superintendent or some similar head of a department controlling an important group of operative functions. The production of a proper *esprit de corps*, to mention only one product of a well-organized personnel department, is quite as important as producing a

smooth manufacturing layout by which lost mechanical motion is eliminated. The superintendent of production is generally thought of as indispensable—why not the superintendent of personnel relations? The leading units of U. S. industry had met and solved these and many like problems involving employer-employee relationship, when with the advent of New Dealism several of the most important phases of industrial direction were placed under political domination. The National Labor Relations Act changed radically the outlook of the employer upon conditions in his factory, particularly with regard to personnel. His administration policies were subordinated to the rulings and exactions of the National Labor Relations Board, which could require him to continue to employ and pay wages to workers who failed to work for the best interests of the business and of the other workers; he was subjected, also, to restraint by the Board from exercising the formerly natural right to bargain directly with his employees; and the workers themselves in many instances were unable to retain their heretofore inherent freedom of action, and forced to surrender it to strangers who represented themselves to be labor leaders. By late 1939 the A. F. of L., C. I. O., and business were all critical of the Act.

Factory managers were faced with problems undreamed of before the wane of normally prosperous times. Burdened with increasing taxes and expenses, subject to arbitrary mandates and restrictions of various Boards and Administrators, compelled to neglect their vital affairs to engage in the preparation of multifarious reports and questionnaires demanded by numerous public bodies, and with a dearth of markets for the sale of output, operations were curtailed and many factories forced to close down, throwing vast numbers of industrious workers out of gainful employment—into W. P. A. and other forms of relief.

Faculae ('little torches'), so called by Father Schenier of Ingolstadt, who noticed them about 1612 as bright streaks and patches on the sun's surface. They rise from the photosphere and show conspicuously near its margin. Some of them extend 20,000 m. in length, and their duration is sufficient for determination by their means of the sun's rotation.

Faculty. In the educational sense, faculty originally designated one of the chief divisions of university instruction—theology, law, medicine, and philosophy. The term is also applied

to the teaching body of a college or other educational institution, and in this sense is usually confined to the teachers of professional rank. In American colleges the functions of the faculty have in recent years been broadened to include powers of recommendation and appointment to collegiate positions as well as of internal administration.

Fadiman, Clifton (1904-), writer, radio-entertainer, was educated at Columbia; was book editor *The New Yorker* (1933-43); master of ceremonies *Information Please* (1938-).

Faenza, town and episcopal see, province Ravenna, Italy; famous in the 15th and 16th centuries and at present for its pottery (whence *faience*) and majolica. The town has a 15th century cathedral containing many works of art, and a fine art gallery; p. 45,000.

Faguet, Emile (1847-1916), French historian, born at La Roche-sur-Yon. He was one of the most learned and brilliant of modern French literary critics. His works embrace studies on the great French writers of the 16th-19th centuries; monographs on Voltaire (1894); Flaubert (1899), and Zola (1903); *Histoire de la Littérature Française* (1900), etc.

Fagus. See **Beech**.

Fahrenheit, Gabriel Daniel (1686-1736), German physicist and scientific instrument-maker, born at Danzig. He invented an areometer, substituted mercury for alcohol in the tubes of thermometers, and devised the thermometric scale (freezing-point, 32°; boiling-point, 212°) still used popularly and by meteorologists in England, Holland, and the United States.

Faience, or Fayence, a name loosely applied to several kinds of pottery ware. See **POTTERY**.

Fainting, or Syncope, is a form of insensibility due to a temporary anæmia of the brain. It is specially apt to occur after exhaustion arising from over-exertion, wasting disease, fasting, bad air, loss of blood, or any similar cause. Frequently recurring fainting-fits point to serious heart weakness. Fresh air, a dash of cold water on the face, inhalation of stimulants such as alcohol, ether, or ammonia, complete rest, and freedom from excitement soon bring complete recovery from an ordinary fainting fit.

Faoum. See **Fayum**.

Fair. A fair is a market, but it is held less frequently. It generally extends over a longer continuous period, and is of a more miscellaneous character than a market. Every fair was originally a holiday or saint's festival,

which, owing to the concourse of people, was utilized by the itinerant trade. In many cases the commercial aspect has now completely disappeared, the name in Britain being frequently appropriated for an annual local holiday. In France, in the Champagne country, there were in the 12th century six fairs—Provins, Troyes, etc.—extending over the whole year, and the money used at these fairs was a kind of international currency; hence Troy weights. The importance of fairs diminished in England after the time of Edward I. One of the most famous of English fairs was that of Stourbridge, near Cambridge, of which descriptions are given by Defoe and Thorbold Rogers. Another great English fair was that of St. Bartholomew, held at Smithfield, London, until 1855. The great fairs at Leipzig, where leather, cloth, and furs are sold, at Frankfort, and at Nijni-Novgorod are the best known in modern Europe; but others of importance are or were held at Beaucaire in France, Irbit in Russia, Pesth in Hungary, and Bergamo in Italy. In the United States the fair as a market does not exist; but it has been adopted in some places as a kind of minor exhibition either in connection with an agricultural or live-stock exhibition or a local industrial exhibition. The county fair usually includes horse-racing and other sports.

World's fairs, as expositions of manufactures, have been held in the United States several times since the Centennial held in Philadelphia in 1876. The latest were the Century of Progress Exposition, at Chicago, 1933-34; and the Golden Gate International Exposition, at San Francisco, and the New York World's Fair, both in 1939 and 1940. See **EXHIBITIONS**.

Fair, James Graham (1831-94), American 'bonanza king,' was born near Belfast, Ireland, and was brought to America in 1843 by his parents, who settled in Geneva, Ill. On the discovery of the Comstock Lode in Virginia City, Nev., he removed to that place, and in 1867 organized a combine with Mackay, Flood, and William T. O'Brien, the four eventually gaining control of the principal silver mines in that vicinity and clearing up over \$100,000,000 in the process. Mr. Fair was elected U. S. senator from Nevada in 1881.

Fairbairn, Andrew Martin (1838-1912), Scotch divine and author, born near Edinburgh. He became principal of Airedale College in 1877. He delivered lectures on the Lyman Beecher foundation, at Yale Divinity School, and was also principal of Mansfield College, Oxford, to which he was appointed

in 1886, and one of the constituent fellows of the British Academy. His principal works are *Studies in the Philosophy of Religion and History* (1876), *The Place of Christ in Modern Theology* (1893), *Philosophy of the Christian Religion* (1902).

Fairbairn, Sir William (1789-1874), Scottish civil engineer, born at Kelso, Roxburghshire. He was the first in England to build an iron ship. With Robert Stephenson he designed the great tubular bridge across the Menai Strait, and was one of the founders of the British Association for the Advancement of Science, of which he was president in 1861. He was the author of many works on engineering matters, including *Mills and Mill Work* (4th ed. 1878); *Iron: its History and Manufacture* (3d ed. 1869); *Iron Shipbuilding* (1865). See his *Life*, edited by W. Pole (1877).

Fairbanks, largest city in the territory of Alaska and center of the Fairbanks gold-mining district.

Fairbanks, Charles Warren (1852-1918), American politician, born in Union co., Ohio. He was chairman of the Republican State Convention in 1892, and U. S. Senator from Indiana, 1897-1904. In 1898 he was a member of the British-American Joint High Commission. From 1904 to 1908 he was Vice-President of the United States.

Fairbanks, Douglas (1883-1939), actor, born in Denver, Colorado. He first appeared on the stage in New York in 1901 and starred in numerous plays including *A Gentleman from Mississippi* and *Show Shop*. He later starred in motion pictures and since 1916 has been head of his own producing company. Among the many pictures in which he has appeared are: *The Three Musketeers*; *The Thief of Bagdad*; *The Iron Mask*, and *The Private Life of Don Juan*. In 1907 he married Anna Beth Sully; divorced 1918; in 1920 he married Mary Pickford; divorced, 1935; in 1936 he married Lady Ashley (Sylvia Hawkes).

Fairbanks, Douglas, Jr. (1908-), began as an 'extra' in films in 1920; appeared in *Siella Dallas*, 1925, *The Barker*, 1927, *Outward Bound*, 1929, and has had important parts in other pictures. He has also acted on the stage in *Young Woodley*, *The Jest*, and others. He married Joan Crawford, 1929 (divorced).

Fairbanks, Thaddeus (1796-1836), American inventor and manufacturer, was born at Brimfield, Mass. Thaddeus was granted his first patent for an improved platform scale in 1831, and this was followed by about fifty others, covering all varieties of weighing ma-

chines, his firm devoting themselves to their manufacture thereafter.

Fairchild, Charles Stebbins (1842-1924), American lawyer, born at Cazenovia, N. Y. He was attorney-general of New York in 1866-7, secretary of the U. S. Treasury in 1877-9 and a member of the Indianapolis Monetary Commission of 1897. From 1889 to 1905 he was president of the New York Security and Trust Company.

Fairchild, Lucius (1831-96), American soldier, born at Kent, Ohio. He commanded the 'Iron Brigade' at Bull Run, and was severely wounded at Gettysburg. He was governor of Wisconsin in 1866-72, and minister to Spain in 1880-2.

Fairfax, Albert Kirby, 12th Baron Fairfax of Cameron in the peerage of Scotland (1870), born in Prince George co., Md. He was the first of the American Fairfaxes to formally lay claim to the peerage (dating from 1627), and in 1908 the Committee on Privileges of the House of Lords upheld his right to the rank and title of Lord Fairfax of Cameron.

Fairfax, Thomas, Lord (1612-71), English parliamentary general in the civil war, was born at Denton in Yorkshire. He assisted Cromwell in his victory at Winceby (1643) and at Marston Moor (1644), and was then appointed by the House of Commons to be commander-in-chief, and entrusted with the reorganization of the army (1645). He defeated Charles I. at Naseby in the same year, and approved of the trial and deposition of Charles, but tried to prevent his execution. See his *Memorials*, his *Psalms* and poems; also Markham's *Life of Fairfax* (1870), with a list of pamphlets relating to his campaigns; and *The Fairfax Correspondence* (4 vols., 1848-49).

Fairfax, Thomas, sixth Baron Fairfax of Cameron in the peerage of Scotland (1692-1782), was born in England of ancient lineage. Upon succeeding to his great estates in Virginia, Thomas sent his younger brother, Sir William, to Virginia, and followed himself in 1739. Sir William's daughter married Lawrence Washington, brother of George Washington, and Lord Fairfax took young George into his employ as a surveyor, thus beginning a lifelong friendship.

Fair Head, or **Benmore Head**, promontory on the northern coast of County Antrim, Ireland, east of Ballycastle Bay, about 640 ft. high.

Fairies, popularly conceived to be delicate little beings, of almost microscopic size, more or less human in shape, and with gauzy wings. On the other hand Shakespeare's Falstaff is

made to believe that well grown youths and maidens are fairies. It is probable that the vast mass of European fairy traditions dates from the early days of the struggles between Celts or Teutons and the small dark race which preceded them, and that the imaginary fairies owe their diminutive size to exaggerated tales of the short stature of those Euskarian aborigines.

Modern research points out that there is supposed to be a strong infusion of fairy blood in the people of Guernsey, who have an old tradition that their island was once invaded by fairies, who fought a bloody battle with the natives, killed or enslaved all the men, and married the women.

Some of the accounts of fairies suggest, however, that they were possessed of a culture superior to that of their neighbors, and certain writers are inclined to regard the gypsies as the originals of the fairies. The Peak Cavern in Derbyshire is alike remembered as 'one of the entrances into Fairyland,' and as a famous rendezvous of gypsies in past centuries. The extensive literature of this obscure subject includes Campbell's *Popular Tales of the West Highlands*; Croker's *Fairy Legends of Ireland*; Rhys' *Celtic Folklore*; Jacobs' *English Fairy Tales*; Kennedy's *Legendary Fictions of the Irish Celts*; Littlewood's *The Fairies—Here and How* (1914); Yearsley's *The Folklore of Fairy-Tale* (1924); Faulkner's *Tales of Many Folk* (1926). See also DWARFS, ELF, GNOME, GOBLIN, PUCK.

Fair Isle, island, Scotland, between Orkney and Shetland. It is famous for its hand-knit hosiery; p. about 200.

Fairlie, village, Scotland, in Ayrshire, 2 1-2 m. s. of Largs. It is celebrated for yacht building. Among the yachts built here by the Fifes were the *Valkyries* and the *Shamrocks I., II., and III.*, competitors in the American Cup races (1899-1903).

Fairmount College, known since 1926 as the University of Wichita, a co-educational institution under Congregational control at Wichita, Kansas, founded in 1892 as a preparatory school, reorganized as a college in 1895 and again reorganized in 1926. It comprises four colleges, *viz.* Liberal Arts, Business Administration and Industry, Education, and Fine Arts.

Fair Oaks, Battle of. See *Seven Pines, Battle of.*

Fairweather, Cape, on the southeastern coast of Alaska, about 300 m. s.e. of Prince William Sound.

Fairweather, Mount, peak, over 15,000 ft.,

Alaska, in the Saint Elias range, 20 m. n.e. of Cape Fairweather.

Fairy Rings, circles in lawns or pastures of either more luxuriant growth than the surrounding grass, or else almost bare of grassy growth. They were formerly supposed to be the marks of fairy dances, but are really due to the presence of a little fungus, the oread or fairy-ring champignon (*Marasmius oreades*), the spores of which fall every year outside the ring on which the champignon has grown, until the fungus dies out.

Faisans, Ile des, or Ile de la Conference. small island in the Bidassoa, near Irun, between France and Spain. Here, in September, 1659, the Treaty of the Pyrenees was concluded between France and Spain.

Faith, a fundamental element in the religious consciousness, and one which fills a supreme place in Christian life and doctrine. With God or Christ for its object, as often in the gospels and in the Pauline epistles, faith comes to signify a personal heart-felt conviction of, associated with humble self-surrender to, the divine. In the Middle Ages it was generally regarded as mere mental acceptance of the Christian dogmas on the authority of the church.

Luther and the reformers, strove to recover the original evangelical conception of faith—*i.e.* the warm personal adhesion to God in Christ; and, laying this at the foundation of the Christian life, they promulgated the characteristic Reformation doctrine—justification by God's grace through faith alone. Faith, however, must also be regarded as the assent to the authoritative teaching of the church; and the fact that the revelation of divine truth is made only to faith, has led to much discussion as to the true relation between it and ordinary scientific knowledge. Consult James' *The Will to Believe*; Bright's *The Law of Faith*; Gordon's *Ultimate Conceptions of Faith*; Hall's *Relations of Faith and Life*; Inge's *Faith and Its Psychology*.

Faith-healing, the doctrine which holds that sickness may be cured without medical aid, by the prayers of believers, and the experience of true faith on the part of the sufferer.

Faith-healing doctrines have been popular in Sweden, England, and the United States. The supposed miraculous cures at Lourdes in France, and at Sainte Anne de Beaupre near Quebec, are famous, and similar cases are reported to have occurred repeatedly from the earliest times.

The Emmanuel Movement, which was

started in Boston in 1906, was a good example of faith-healing. It sought to bring into effective co-operation the physician, the psychologically trained clergyman, and the trained social worker in the alleviation and arrest of certain disorders of the nervous system. See also CHRISTIAN SCIENCE; PSYCHOTHERAPY. Consult Cutten's *Three Thousand Years of Mental Healing*; Worcester and McComb's *The Christian Religion as a Healing Power and Religion and Medicine*.

Faïum. See **Fayum**.

Faizabad, or **Fyzabad**, chief town of Faizabad district, United Provinces, India, is situated on the left bank of the Gogra River, on the site of the ancient city of Oudh. It contains the mausoleum of the Bahu Begani, the finest one in the province, and the mausoleum of Shujaud-daula; p. about 75,000.

Faizabad, capital of the Afghan province of Badakhshan, Central Asia. It is noted for its rubies; p. 2,500.

Fakirs, Mohammedan and Hindu religious mendicants or ascetics. See **DERVISEES**.

Falaise, town, department of Clavados, France, is situated on the river Ante, 20 m. s.e. of Caen, on a rocky hill on which stands the castle in which William the Conqueror was born (1024); p. 6,847.

Falashas, Hamitic tribe of Abyssinia, supposed to be descended from Jewish immigrants of the time of Solomon. A conquering people in the middle ages, they are now hard working and peaceful, living in scattered communities, practising Jewish rites, and speaking a dialect akin to the Agau.

Falcon, a name applied in general to birds of prey of the sub-family Falconinæ, of the order Falconidæ. The most typical member of this family is the Peregrine or Duckhawk (*Falco peregrinus*), which is widely distributed. The peregrine is the bird most commonly chosen in modern revivals of Falconry. Other American falcons include the gersfalcon, goshawk, and pigeon-hawk. Among European falcons are the merlin, hobby and kestrel.

Falcon, state of Venezuela, South America, lies on both sides of the Gulf of Maracaibo and along the coast of the Caribbean Sea. The area is 36,212 sq. m. The capital is Coro; p. 139,110.

Falcone, Amillo (1600-65), Italian painter, was born in Naples. He is especially famous for his battle pieces. Of his numerous pupils, Salvatore Rosa was the most distinguished.

Falconer, Hugh (1808-65), Scottish botanist and palæontologist, was born in Forres, Elginshire. He was appointed superintendent

of the Saharanpur botanic garden (1832), and of the Calcutta botanic garden (1847). The successful introduction of tea-growing into India was mainly due to his efforts.



Falcon.

Falconer, Sir Robert Alexander (1867-1943), Can. educator and man of letters, was born in Charlottetown, Prince Edward Island. He was president of Toronto University 1907-1932; was created K.C.M.G. by King George in 1917; and has received honorary degrees from British, American, and Canadian universities. He is the author of *The Truth of the Apostolic Gospel* (1904), *Idealism in National Character* (1920).

Falconer, William (1732-69), Scottish poet, was born in Edinburgh. His nautical career prompted his *Universal Marine Dictionary* (1760), and his remarkable poem of *The Shipwreck* (1762), founded on his own early experience. Consult biographical introductions to *The Shipwreck*, by J. S. Clarke (1804), and by Alexander Chalmers in *English Poets*, vol. XIV (1810).

Falconry, the art of taking game by means of trained falcons and hawks, is believed to have been known in China some four thousand years ago. It was early practiced in other Eastern countries and in continental Europe, and in England was the chief sport of the aristocracy from the days of Alfred to those of James I. In France it flourished down to the reign of Louis XIII. Of late years the taste for falconry has manifestly increased in Great Britain. It is practiced in Holland and France and to some extent in America.

The birds employed by falconers belong to

two classes—the long-winged, dark-eyed falcons, and the short-winged, yellow-eyed hawks. The former take their prey by rising above it in the air, and *stooping* at it from a considerable height, and striking it to the ground; the latter pursue in a straight line, and, overtaking the quarry by superior speed, clutch it, and come down with it.

Among the older works on falconry, Simon Latham's *The Falconer's Lure and Cure* (1633) is one of the very best. Schlegel's *Traité de Fauconnerie* (1844-53) ranks high among modern treatises, and contains a very full bibliography. Other excellent works are *Falconry in the British Isles*, by Salvin and Brodrick, admirably illustrated; *Falconry: Its History, Claims and Practice*, by Freeman and Salvin; G. E. Freeman's *Practical Falconry*, and *Falcons and Falconry*.

Faldstool, a movable folding chair used by bishops or other ecclesiastics of high rank when not occupying their throne or when in other than their own churches. The term is also used for a small desk used at the ceremony of coronation or by the clergy for the saying of the Litany.

Faleme, or **Tenne**, river Senegambia, West Africa, rises on the northern borders of French Guinea, and flows over 200 m. to join the Senegal.

Falerii, ancient town, Etruria, Italy, not far from Mount Soracte. One of the league of twelve Etruscan cities, it was taken by the Romans in 394 B.C. In 241 it revolted, and was destroyed.

Falernian Wine, a famous wine of ancient Roman times, praised by Horace. It was made from grapes grown in the *Falernus Ager*, in the northwest of Campania and is still made.

Falguiere, Jean Alexandre Joseph (1831-1900), French sculptor, pupil of Joffroy, was born in Toulouse. His statues of *Lamartine* (1876) and *Eve* (1880), and his two markedly different conceptions of *Diana* established his reputation for vigorous, sympathetic, thoroughly modern work, further confirmed by the later productions of his chisel, *Progress Abasing Error* (Pantheon), and the *Poet Holding a Lyre* (Place de l'Opera), a figure of striking simplicity and grace.

Faliero, Marino (?1274-1355), doge of Venice, elected in 1354, after a distinguished career as a military leader, in the course of which he defeated the Hungarians and captured Zara.

Falk, Paul Ludwig Adalbert (1827-1900), German jurist and statesman, was born in

Metschkau in Silesia. He was appointed minister of educational and ecclesiastical affairs in Prussia (1872), in which office he strenuously supported Bismarck in the Kulturkampf, and introduced the celebrated 'May Laws,' directed against the Roman Catholic Church (see GERMANY, History).

Falkenhayn, Erich von (1861-1922), German general, became Prussian minister of war in 1913, succeeded von Moltke as chief of staff in 1914, was responsible for the first Battle of Ypres (1914), and prepared the great onslaught on Verdun, the failure of which led to his retirement (1916). In the fall of 1916 he was in command of the Austro-German offensive against Roumania across the Transylvanian Alps, and in 1917 of the German-Turkish armies in Mesopotamia and Palestine. He wrote *General Headquarters, 1914-1916, and Its Critical Decisions*.



Erich Von Falkenhayn.

Falkirk, market town in Shropshire Scotland; 25 m. n.w. of Edinburgh; once famous for its cattle 'trysts' or open markets. Near the town the Scots under Wallace fought an engagement with Edward I., in 1298, and here in 1746 Prince Charles Edward defeated the English under General Hawley; p. 33,569.

Falkland, Lucius Cary, Second Viscount

(?1610-43), English writer and politician. He took part on the royalist side, and was killed at the battle of Newbury (Sept. 20, 1643). He wrote *Poems* (collected by A. B. Groshart in 1870) and a *Discourse on Infallibility* (1651).

Falkland Islands or *Iles Malouines*, a British colony in the South Atlantic Ocean, about 300 m. e. of Magellan Strait. They consist of East and West Falkland, with about 100 smaller islands, the total area of the group being 6,500 sq. m. South Georgia (1,000 sq. m.), lying south of the group, is a dependency. The surface of the islands is chiefly rocky moorland, with numerous small rivers and lakes, the highest point being Mount Adam (2,315 ft.) in West Falkland. The coasts are deeply indented, and there are several good harbors; the climate is generally healthful but bleak. Sheep rearing and whaling are the chief occupations. Stanley, in the northeastern part of East Falkland, is the only town of importance; p. 3,252, mostly Scotch.

The Falkland Islands were discovered by John Davis in 1592. British occupation dates from 1832. In the World War I a battle was fought, Dec. 8, 1914, off the Islands, between a British and German squadron, in which four out of five German battleships were sunk.

Falkner, William (1897-), author, born in New Albany, Mississippi. Among his works are *The Marble Faun* (1924), *The Sound and the Fury* (1929), *As I Lay Dying* (1930), *Sanctuary* (1931), *Light in August* (1932), *The Green Bough* (1933), *Pylon*, (1935), and *Absalom, Absalom* (1936), *The Hamlet* (1940).

Fall, The, a term applied in Christian theology to the disobedient act of our first parents, as described in the third chapter of Genesis, whereby sin entered into and gained an ascendancy over the human race. The connection between the first act of transgression and the sinfulness of mankind at large is indeed not overtly expressed in the Old Testament, but it is explicitly asserted in the Apocrypha, thus providing Christian theology with one of its most perplexing problems. The parallel drawn by Paul between Adam and Christ seems certainly to indicate that the transgression of the former has in some way influenced for evil the whole of mankind, and upon this the church has built up the much-veiled doctrine of original sin. See ADAM AND EVE; ORIGINAL SIN.

Fall, Albert Bacon (1861-1944), an American cabinet official. He became U.S. Senator from New Mexico in 1912, and in 1921,

he was appointed Secretary of the Interior by President Harding.

In 1922 Fall signed a lease of the Teapot Dome oil district to the Sinclair oil interests and also a lease of the Elk Hills reserves to E. C. Doheny. Growing out of the alleged conspiracy involved in signing these leases, Fall was convicted of accepting a bribe of \$100,000.

Fallacy. Fallacies are errors in reasoning, to be distinguished from illusions, which are false perceptions, and from errors of judgment in comparison, etc. A formal fallacy is one which violates the formal laws of reasoning, and which can therefore be detected without reference to the subject-matter reasoned about. Material fallacies are those whose detection and exposure require an appeal to our knowledge of the subject-matter reasoned about. Ambiguity of language is itself one of the main sources of fallacy, because it naturally involves more or less confusion of thought. Consult Sidgwick's *Fallacies*.

Fallen Timbers, Battle of. See WAYNE, ANTHONY.

Fallieres, Clement Armand (1841-1931), 8th President of the French republic, was born in Mezin, department of Lot-et-Garonne. He was under-secretary in the ministry of the interior (1880-82) and for twenty-two days during the following January he was prime minister. Having entered the senate from Lot-et-Garonne in 1890, he was chosen president of that body in 1899, an office which he filled for seven years. In 1906 he was candidate of the Radical Republican and the Socialist bloc for President of the Republic, and was elected by the National Assembly (Jan. 16) by a vote of 449 to 371, his opponent being Paul Doumer, a candidate of the reactionary elements. He was succeeded (1913) by M. Poincare.

Falling Sickness, a popular name for epilepsy. See EPILEPSY.

Falling Stars, also called 'shooting stars,' minute planetary bodies raised to incandescence by the resistance offered to their motion by the earth's atmosphere. They approach from every direction indifferently, generally with parabolic velocity; begin to glow perceptibly at an average elevation of 70 m. and become extinct by the entire consumption of their materials while still 20 m. or more from the earth's surface. See METEORS.

Fallopian Tubes, in the human female, the ducts passing from either uterine cornu to

the ovary, through which the ovum is conveyed to the uterus. See UTERUS.

Fallopian, Gabriel (1523-62), Italian anatomist, was born in Modena. He is famous chiefly for his discoveries in physiology. He was the first to recognize the peculiar functions of the Fallopian tubes, and he threw much light on the structure and internal working of the ear and other organs. His chief work was *Observationes Anatomicae* (1561).

Falloux, Frederic Alfred, Pierre, Comte de (1811-86), French politician, historian, and man of letters, was born in Angers. His *Histoire de Louis XVI.* was published in 1840 (newer ed. 1886), and was followed, three years later, by a *Histoire de Pie V.* (newer ed. 1869). Among his published works are *Madame Sweet-chine, sa vie et ses œuvres* (1860); *De la contre Révolution* (1878); *Etudes et Souvenirs* (1885).

Fallow, in its original sense meant a period of rest for cultivated land. The term black or bare fallow applies to both tilled and untilled land kept free from cropping for a season, in order to allow the weathering and biological agencies a better opportunity to render the plant food of the soil available. Since it has been clearly shown that black fallowing is a species of soil robbery, causing losses of considerable amounts of plant food, the system has been largely replaced by the more rational practice of green fallowing, which consists of growing crops, particularly leguminous plants, on the soil in intervals of other cropping, to increase and conserve the available plant food, improve the tilth, and choke out weeds. See FERTILIZERS; ROTATION OF CROPS.

Fallow Deer (*Cervus dama*), a native of the countries bordering the Mediterranean, whence at some unknown date it was introduced into Central Europe and Great Britain, where it leads a vigorous semi-domesticated life in many parks. Apart from the conspicuous white spots, which are absent in some varieties, the fallow-deer can be recognized by the characteristic antlers of the stag.

Fallows, Samuel (1835-1922), American clergyman, born in Pendleton, Lancashire, England. From 1859 to 1875 he was a minister of the Methodist Episcopal Church, and in the latter year joined the Reformed Episcopal Church, becoming rector of St. Paul's R. E. church in Chicago. In 1876 he was made bishop. He was chairman of the general educational commission of the World's Congresses at the Chicago Exposition. Among his published works are: *Briticisms, Americanisms, Colloquial Words and Phrases* (1883); *Chris-*

tian Philosophy (1905); *Health and Happiness* (1908).

Fall River, city and port of entry, Bristol co., Massachusetts, is situated on the eastern shore of Mount Hope Bay, near the boundary of Rhode Island. Fall River is pre-eminently a manufacturing city. Abundant water-power is supplied by the Quequechan River, the main mill stream of the city, which descends 127 ft. in less than half a mile from Watuppa Lake. The manufacture of cotton, which is the chief industry, is carried on on a greater scale than in any other city in the United States. Fall River is also an important receiving and distributing center for fuel oil. In 1904 Fall River witnessed the most serious strike in the history of the American textile industries; p. 115,428.

Falmouth, municipal and parliamentary borough (with Penryn), seaport, and popular watering place, Cornwall, England, on Falmouth Bay; 11 m. s. of Truro. It has one of the finest harbors in England; p. 13,136.

False Imprisonment, is the confinement or detention of a person without lawful authority. It generally involves at least a technical assault in the sense that a person is coerced by threats or gestures into suffering himself to be detained or imprisoned. See MALICIOUS PROSECUTION.

False Point (so called because frequently mistaken for Point Palmyras), cape, harbor, and lighthouse, Cuttack district, Bengal, India. The harbor is the best, with the exception of the Hugli, on the east coast of India.

False Pretences, fraudulent misrepresentation of fact made for the purpose of wrongfully obtaining money or property from a person, and actually inducing him to part with it without consideration. This is a penal offence under statutes in the United States and England, although in some states the offence is classed as larceny. See FRAUD, LARCENY.

Falsetto, the name given to the highest register of male voices. The term probably originated in the entirely different tone-color of this register from that of the others. See VOICE.

Falstaff, Sir John, Shakespeare's greatest comic character, appears in the play of *Henry IV.* as the companion of Prince Hal, and again in private life in the *Merry Wives of Windsor*. The original name of the character was Sir John Oldcastle, the Lollard martyr, but this was changed to Sir John Fastolfe, an English general (?1378-1459) who had acquired an unfounded reputation for cowardice in the French

wars, and had been owner of a certain Boar's Head Tavern.

Falster, Danish island, in the Baltic Sea, s. of Sjælland (Zealand), is about 30 m. long and from 2 to 13 m. broad. The chief town is Nykjøbing; p. 37,460.

Falun, town, Kopparberg co., Sweden, famous for its copper mine, which is classed among the richest in the world and has been worked since the 14th century; p. 13,340.

Famagosta, or **Famagusta**, seaport on the e. coast of Cyprus, on the supposed site of ancient Arsinoë, 25 m. n.e. of Larnaka; p. 6,980.

Fame, Hall of. See **New York University**.

Familiar, an evil spirit in attendance upon a magician, wizard or other professor of the black art, frequently in the form of a black dog or cat, or other animal.

Familiars of the Holy Office, an order of laymen, also called the Militia of Christ, established by St. Dominic (13th century) to assist the Inquisition in its work. See **INQUISITION**.

Family. The family as an actual institution is a social group consisting of a man, his wife (or wives), and their children, with an outer circle of kindred of uncertain extent. In some cases the conception is wider, including pious reference to former generations and a consideration of generations yet to come.

There are at least three types of family—the Matriarchal, that in which the wife is at the head; the Patriarchal, which is almost universally accompanied by polygamy; and the monogamic family. The latter attained special importance under Christian influence and is considered the highest form of the family yet attained. The question of what was the earliest type of family is still undecided, some scholars affirming that primitive man lived in a condition of promiscuity and others asserting that the monogamic family was the original type. See Lubbock's *Origin of Civilization* (6th ed. 1902); Thwing's *The Family* (1913); G. Eliot Smith's *Human History* (1930); and essays of Andrew Lang, particularly *Social Origins* (1903). See also **MARRIAGE** and **TOTEMISM**.

Family (in zoology), a grade in classification lower than order, composed of genera having a certain grade of likeness. The group is indicated by the termination *idæ*, as Bovidæ, the cattle family.

Family Compact, a term applied to certain alliances formed in the 18th century by the Bourbon kings. The term is likewise used in Canadian history to mark the politics of the

period before the grant of responsible government.

Family of Love, or **Familists**, a sect founded at Delft (Holland) by David Joris (1505-56), and brought to England by his disciple, Henry Nicolai. The Familists practically rejected doctrine and ceremony, holding that religion was simply love, which made man one with God. The sect gradually died out during the 17th century. See Blunt's *Dictionary of Sects* (1874). The Family of Love was attacked in the writings of George Fox and Henry Moore.

Famine. The causes of famine are various—deficiency or excess of rainfall, frosts, and unseasonable weather, plagues of insects, grasshoppers, locusts, etc., war and devastation, acting on predisposing social and economic conditions, such as imperfect means of communication, insufficient diversity of industry, lack of thrift and foresight in storing foods in times of plenty, oppressive taxation, etc. The comparative immunity of modern civilization is due to the organization of modern commerce and to the removal of those short-sighted restrictions on buying and selling that were the favorite remedies of legislators in the middle ages. In the middle ages famines were recurrent, but were generally partial in extent; and in modern India, which presents the most striking area for observation, the same recurrent tendency appears.

In the Irish famine (1846-7), due to the failure of the potato crop, the death-rate was enormously increased both as the result of direct starvation and as the result of 'famine' fever. See Thorold Rogers's *History of Agriculture* (1866-1902), Hunter's *Indian Empire* (new ed. 1893), and Curschmann's *Hungersnote im Mittelalter* (1900).

Fan (Lat. *vannus*), the implement used for cooling or rather circulating the air, is of Chinese origin. The earliest was a palmetto leaf, but later varieties were made of bamboo, the end split into brins and covered with paper. In the East they have always been symbols of royalty or authority, being intimately connected with ceremonial observance. The article reached England in Elizabeth's reign as a modified tuft of feathers. Folding fans were invented by the Japanese, and Catherine de' Medici introduced this variety from Italy into France. Paris has always been the headquarters of the fan-making industry in Europe. See Octave Uzanne's *The Fan* (1884); Salwey's *Fans of Japan* (1894); Flory's *A Book about Fans* (1895); Lady C. Schreiber's (C. E. Guest) *Fans and Fan Leaves* (1890); Georgiana Hill's

History of English Dress (1893). For electric fans, see VENTILATION.

Fan, Revolving. See **Blowing Machines, Ventilation.**

Fanariots, or **Phanariots**, the Greek inhabitants of the Fanar quarter of Constantinople, who are the descendants of those noble families who escaped assassination by the Turks at the capture of Constantinople in 1453.

Fandango, a lively Spanish dance in triple time derived from the Moors—a variety of the *sequidalla* and *bolero*, accompanied by the guitar and castanets, and danced by two persons, male and female.

Faneuil, Peter (1700-43), American merchant of Huguenot descent, born at New Rochelle, N. Y. He settled at Boston, where he erected at his own expense a combined market and town hall (1740-2). Smibert, the portrait painter, was the architect. Faneuil Hall was almost destroyed by fire in 1761, was rebuilt in 1763, and was enlarged in 1806, in accordance with designs of the noted architect, Charles Bulfinch. During the Revolutionary period the main hall was often used for meetings of the Whigs or Patriots, and the building came to be known as 'The Cradle of Liberty.' See Brown, *Faneuil Hall and Market* (1901).

Faneuil Hall. See **Faneuil, Peter.**

Fanfare, a short flourish of trumpets performed at coronations and other state ceremonies. The fanfare is used with effect by Beethoven in *Fidelio*, and by Schumann in his *Eb* symphony.

Fangs (of snakes), the name applied to the grooved or canaliculate teeth down which the poison flows in venomous snakes. They are absent in the harmless snakes, which have teeth of the ordinary reptilian type. When present the fangs may be posterior in position, as in the tree-snakes. In the deadly cobras and their allies the grooved fangs are anterior in position, thus enabling the reptiles to use them much more effectively. See H. Gadow's *Amphibia and Reptiles* (1901).

Fanning, coral island of the Pacific Ocean, 4° n. latitude, 159° w. longitude. Area, 15 sq. m.; p. 150. Great quantities of mother-of-pearl are taken from its large lagoon. It was annexed by Britain in 1888, and is utilized as a station on the Pacific cable from Vancouver to Australia.

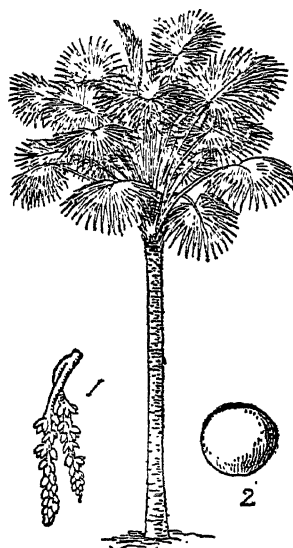
Fanning, Edmund (1737-1818), American soldier, a Loyalist during the Revolutionary War, born on Long Island, N. Y. During the Revolutionary War he commanded the regiment known as the 'Associated Loyalists,' was

conspicuous in the British partisan service, and in 1783 fled to Nova Scotia. He became a major-general in the British Army (1794), a lieutenant-general (1799), and a general (1808).

Fano, town, episcopal see, and seaside resort, province Pesaro e Urbino, Italy, on the Adriatic Sea. It possesses a cathedral, but its principal feature is a triumphal arch of Augustus. Pope Clement VIII. was born here in 1536; p. 27,000.

Fanö, island in North Sea, off s.w. coast of Jutland, Denmark. Area, 20 sq. m. On the e. coast is the chief town, Nordby, and on the w. coast the fashionable bathing-place, Fanö.

Fan Palm is a name given to certain palms belonging to the genera *Corypha*, *Chamærops*, *Sabal*, and *Livistona*. They are often cultivated as greenhouse and window plants, and derive their popular name from the shape of their leaves.



Fan Palm.

1, Part of inflorescence (male);
2, single fruit.

Fans, or **Ba-Fan**, an African tribe inhabiting the French Congo, in the mountainous region of East Gabun. Tall, well-formed, orthognathous, and of a lighter complexion than the surrounding races, they are believed to have come from the north-east, and are still pressing west. They are pronounced cannibals. See Mary Kingsley's *Travels in West Africa* (1897).

Fanshawe, Sir Richard (1608-66), English diplomatist and translator, was born at Ware Park, Hertfordshire. At the outbreak of the civil war he joined Charles I. at Oxford, was appointed secretary of war to Prince Charles, and employed in royalist negotiations in Spain, Ireland, and elsewhere. After the Restoration he served as ambassador to Portugal and Spain. Translations: Guarini's *Pastor Fido* (1647); *Horace* (1652); Camöens's *Lusiads* (1655), etc. See *Memoir* by his wife, ed. by Sir H. Nicolas (1829).

Fan Tan, a game of cards derived from a Chinese gambling game. Any number up to eight may play, a whole pack of cards being used.

Fantasia, an instrumental musical composition ungoverned by the ordinary forms. The term was originally descriptive of the pieces now called sonatas, and in still earlier times, borrowing from poetry, 'madrigals.' It is employed to express the development of a musical thought—a *fancy* after the manner of the fugue—and is now mainly applied to those showy arrangements of operatic melodies and variations of popular airs which form a sort of musical *melange*.

Fanti, one of the Tshi group of negroes occupying the coast lands of the Gold Coast of West Africa. They are now under British rule. Like the Ashantis, they are fetish worshippers. See Ellis's *The Tshi-speaking People* (1887).

Fantin-Latour, Ignace Henri Jean Theodore (1836-1904), French painter, was born at Grenoble. He first exhibited at the Salon in 1861, and excelled as a portrait painter and a delicate delineator of flowers. His best-known portrait groups embrace *Hommage à Delacroix* (1846), *Manet's Study at Batignolles* (1870), *Coin de Table* (1872), and *Auour du Piano* (1885). He was also distinguished as a lithographer, his subjects being from Wagner, Berlioz, and Schumann.

Fan-tracery Vaulting is composed of a series of lines cutting obliquely the vaulting surface of a structure, radiating from a central point of initiation, and terminating at the apex of the ceiling, where the boundary line forms a circle, and encloses what is technically termed the *plafond*. A series of intermediate ribs or lines ornaments the lower compartments of the composition, while a subdivision of intersecting lines enhances the fan-tracery effect and the decorative value of the whole. A striking example is the vault of Henry VII.'s Chapel, Westminster Abbey. It is the distinctive vault of the advanced Perpendicular period, and had

its primary elements in the groin-rib and pointed arch of Early English architecture.

Fao, town, at the head of the Persian Gulf, near the mouth of the Shat-el-Arap. The cable to Bushire and India is here connected with the Turkish telegraph system.

Farad, the unit of electrical capacity. It is the capacity of a body which, when charged with one coulomb, or unit quantity of electricity, has its potential raised by one volt. It is equal to 10^{-9} of a C.G.S. unit. The *microfarad* is the millionth part of a *farad*.

Faraday, Michael (1791-1867), English chemist, electrician, and natural philosopher, was born at Newington Butts, London, the son of a blacksmith. His famous discovery of magneto-electric induction was published in 1831, and for the succeeding fifteen years, with an interval of three years (1841-4), during which he was abroad and in poor health, almost every year saw some remarkable discovery made by him in connection with magnetism and electricity. His most important investigations and discoveries were connected with the following subjects: liquefaction of gases (1823 and 1844); identity of electricities from different sources (1833); electro-chemical decomposition (1834); the relation of electric and magnetic forces (1838); magnetic rotatory polarization (1845); diamagnetism (1846); polarity of diamagnetics, and the relation of diamagnetism to crystalline forces (1849), etc. In 1829 Faraday commenced his Christmas lectures, which he continued for many years, and in 1833 he became Fullerian professor of chemistry at the Royal Institution. His chief published works are: *Treatise on Chemical Manipulation* (1827-1842); *Experimental Researches in Electricity* (1839-55); *Experimental Researches in Chemistry and Physics* (1859); *Forces in Nature* (1860); *Lectures on the Chemical History of a Candle* (1861). Consult *Faraday's Life and Letters* by Bence Jones; *Faraday as a Discoverer*, by Tyndall; and *Life of Faraday*, by S. P. Thompson.

Faraday's Law. See **Electrolysis, Electricity, Current.**

Faradization, the application, for diagnostic or for therapeutic purposes, of a faradic, or interrupted, current, as distinguished from a galvanic, or continuous current. See **ELECTRICITY IN MEDICINE AND SURGERY.**

Farallones, a group of six small islands lying 30 m. off the Golden Gate, San Francisco, Cal., forming a line about 10 m. long, parallel to the coast.

Farce, a dramatic piece of a broad comic

character; it has been styled caricature personified. Farce differs from comedy in degree only. Farce existed at least as far back as the days of Aristophanes. In the middle ages, buffoonery and comic dialogue were introduced first into the mystery, miracle, and morality plays and 'interludes,' and eventually into regular drama. Though present in many of Moliere's comedies farce took no firm hold on popular taste during his time, and disappeared until about the middle of the 18th century, when Gay, with the *Beggar's Opera*, created musical farce, and Samuel Foote developed farce proper. See also DRAMA.

Farcy. See **Glanders.**

Farel, Guillaume (1489-1565), reformer, French by birth, was born near Gap in Dauphiné, but spent much of his life in Switzerland (from 1523), where he took an active part in spreading Protestantism and organizing Protestant churches. Consult *Life* by Bevan, and Blackburn's *Farel and the Story of the Swiss Reformation*.

Farewell Address, an address issued (Sept. 17, 1796) to the American people by President George Washington several months before his retirement from office (Mar. 4, 1797). In it he warned his countrymen against party and especially against sectional strife, and against entangling alliances with foreign nations. In the preparation of the address Washington was greatly assisted by Alexander Hamilton, and to a less extent by James Madison. In 1837 President Andrew Jackson also issued a 'Farewell Address.'

Farewell, Cape, the southernmost point of Greenland.

Fargo, city, North Dakota, the largest in the State, and county seat of Cass co., on Red River. It is an important distributing point for wheat, clover, alfalfa, dairy products, cattle, horses, hogs, sheep, and poultry, and ranks also as one of the largest distributing centers for farm machinery in the country; p. 32,580.

Fargo College, a Congregational institution for both sexes at Fargo, N. D., founded in 1887. It comprises a collegiate department, as well as preparatory, grammar, and commercial departments, and a conservatory of music. For recent statistics see Table of American Colleges and Universities, under the heading UNIVERSITY.

Fargus, F. J. See **Conway, Hugh.**

Faribault, city, Minnesota, county seat of Rice co., at the junction of the Straight and Cannon Rivers. The city has a public library

and opera house, is the cathedral town of the Episcopal diocese, and was the home of Bishop Whipple, known for missionary labors among the Indians; p. 14,527.

Farina, properly speaking, is a flour made from any grain, root or starch; as generally used, the term is applied either to a coarse flour from corn, used in making puddings, or a wheat flour used as a breakfast cereal. Farinaeous foods are derived not only from the seeds of the cereal grasses and the Leguminosæ, but also from various roots and tubers. They include wheat, oats, Indian corn, and rice; peas, beans, and lentils; potatoes, arrowroot, tapioca and sago.

Farinata degli Uberti (13th century) Ghibelline leader. Dante immortalized him (*Inferno*, canto x.), for opposing the destruction of Florence, proposed by his allies.

Farinelli (1705-82), whose real name was CARLO BROSCHI, Italian singer, who possessed a remarkable soprano voice, unequalled in compass and power. In 1738 Farinelli went to Spain, where he was appointed court singer, a position he retained till 1759, when he was banished by Charles III.

Farley, James A., (1888-), Postmaster General of the United States from 1933 to 1940, was born at Grassy Point, New York. Beginning as a bookkeeper he became sales manager of the Universal Gypsum Company, organized the James A. Farley Company 1929; merged with five other firms to form the General Building Supply Corporation. He was secretary, New York State Democratic Committee, 1928-30, Chairman Democratic National Committee, 1932-1940.

Farley, John, Cardinal (1842-1918), American Roman Catholic prelate, was born in County Armagh, Ireland. He was ordained priest in 1870. He was made vicar-general of the archdiocese of New York in 1891, and domestic prelate to Leo XIII. in 1892. In 1895 he became prothonotary apostolic, and later auxiliary bishop of New York. Upon the death of Archbishop Corrigan, in 1902, he was appointed administrator of the archdiocese, and later in the same year was made archbishop of New York. At the Consistory held in Rome, Nov. 27-30, 1911, he was elevated to the College of Cardinals. He proved himself a master in church government, and was one of the most influential religious leaders of the day. From the time the United States entered the Great War Cardinal Farley stood squarely behind the Government, for the accomplishment of an enduring peace by the defeat of German Militar-

ism. He is buried beneath the altar in St. Patrick's Cathedral, New York City.

Farman, Elbert Eli (1831-1911), American lawyer and diplomat, was born in New Haven, N. Y. He was diplomatic agent and judge at Cairo, Egypt, and obtained from the khedive, as a gift to the City of New York, the obelisk known as 'Cleopatra's Needle,' now in Central Park. He examined the 10,000 claims arising from the bombardment of Alexandria, 1882, and directed the distribution of the indemnity fund of \$20,000,000.



Fan-Tracery Vaulting, Henry VII's Chapel, Westminster Abbey.

Farman, Henri C. (1879), French aviator, was born near Chantilly, France. His first air-flights were in 1907, and on Jan. 13, 1908, he won the Deutsche-Archdeacon prize of \$10,000 for sailing a kilometre in a closed circuit near Paris. On Nov. 3, 1909 he covered 144 m. in 4 hours, 6 minutes, 25 seconds; and on Dec. 18, 1911, made a new duration record of 288 1-4 m. in 8 hours, 12 minutes, 47 seconds.

Farmer, John (1789-1838), American genealogist, was born in Chelmsford, Mass. He was one of the founders of the New Hampshire

Historical Society, and for a number of years its corresponding secretary. He published the *Genealogical Register of the First Settlers of New England* (1829).

Farmer, Moses Gerrish (1820-92), American inventor, was born at Boscawen, N. H. In 1852 he instituted in Boston the first telegraphic system of fire-alarms. From this time on his inventions followed one another rapidly. The most important were an instrument by which four messages could be sent over one wire at the same time, an electrical cooking stove, a method for depositing aluminum by means of electricity, an electric gyroscope which would run at uniform speed, a process for covering steel wire with a coating of copper, and important improvements in the construction of dynamo-electric machines for firing torpedoes. He suggested the use of the continuity-preserving key in the duplex telegraph. In 1872 he was appointed electrician to the U. S. Torpedo Station at Newport.

Farmers' Alliance, an organization in the United States growing out of the general movement for the promotion of agricultural interests following the Civil War, and reaching the height of its political influence in 1890. Originating in Texas in 1879 as a secret society, whose main object was to unite the farmers of the State in opposition to monopoly and as far as possible eliminate the middleman, the organization soon spread to the adjoining States. Early in the eighties it began to amalgamate with farmers' alliances of various origin in the Middle West, and in July, 1886, a national organization was effected at Litchfield, Ark.

In the meantime a number of similar societies had developed which united with the Alliance in 1887 and 1888 to form the National Farmers' Alliance and Co-operative Union of America. At the national convention of 1889 the plan for a confederation with the Knights of Labor was adopted, and the name of the organization was changed to National Farmers Alliance and Industrial Union.

In 1890 the political influence of the Alliance made itself felt, several States electing governors supported by the organization, but, although continuing as an agricultural organization, it has ceased to be a political party. See also GRANGE.

Farmers-General (*fermiers-generaux*), an association of farmers of the taxes (a term applied to individuals who buy for a certain sum the privilege of collecting taxes) in France, before the revolution of 1789, which was to a large extent caused by their iniquitous exactions.

Farmers' Institutes, organizations formed to extend agricultural information and the social welfare of farmers. Springing from the public meetings, held by the state agricultural societies in early days, they received a great development after the passing of the Morrill Act (1862), and the organization of agricultural colleges. They are now usually conducted by the State agricultural departments or by the agricultural colleges, and are to be found in every State.

Farmers' National Congress, a national agricultural body in the United States, organized in 1881 to secure favorable legislative action on questions relating to agriculture.

Farmers' Union, or, more accurately, **Farmers' Educational and Co-operative Union of America**, an organization of farmers in the United States, which aims to enable farmers to protect their interests against speculators and organized distributors of farm products; to discourage the credit and mortgage system; to assist members in buying and selling; to educate the agricultural class in scientific farming; to systematize methods of production and distribution; to eliminate speculation in farm products; and to secure and maintain profitable and uniform prices for grain, cotton, live-stock, and other farm products. The organization consists of the national union; State unions, affiliated with the national union; and local unions. The first local Farmers' Union was established in Texas, in 1902 and the movement spread rapidly.

Consult C. S. Barrett's *The Mission, History, and Times of the Farmers' Union* (1909)

Farming is the practice or occupation of tilling the soil for a livelihood. The tilling of the land is considered broadly as the growing of crops of all kinds and the rearing of animals maintained on these crops. It is customary to divide the occupation into *general farming*, including the growing of grains and forage, with the live-stock that accompanies it; *horticulture* (see GARDENING), comprising the growing of fruits, vegetables, flowers or ornamental plants, with the rearing of plants in nurseries for sale; and *forestry*, which is the raising of a timber crop. If one specializes in live-stock, the occupation may be known as stock raising, poultry farming, or more particularly as horse breeding or sheep breeding. Bee keeping (see BEES) is also a form of farming. The production of milk and milk products is dairying. The word farming, therefore, does not stand for a single homogeneous occupation, but for a congeries of occupations, all agreeing in deriving income from the cultivation of the earth. The farmer needs

always to improve his methods in order that he may increase his produce at the same time that he saves his soil. Society recognizes this necessity, and has provided institutions for research and for teaching in the rural field. The measure of good farming is expressed not in yields to the acre, but in yields to the man, although the public still evaluates it by the former standard. In countries of high-cost labor and relatively low-cost land, as in North America, it does not pay to produce the maximum acre-yield, except, of course, in certain intensive occupations, as glass-house farming. Human labor costs too much, and it is often better to till more acres by the use of machinery. The ability of man to produce crops is rising. This is due to a better intellectual grasp of the problems, to more effective tools and machines, and to new methods. The service of the farmer to society is not merely as a producer of supplies. The rural range is a type of life, and one of the seed beds of citizenship. It is our nearest approach to a permanent society. This larger relation is to be considered in all policies affecting farming occupations.

In connection with this article see AGRICULTURE, which includes a general history of farming, and the cross references and bibliography there cited.

Farm Relief, a comparatively new term, has come to mean some sort of help to be given by the government to the farmers of the country. The farmers of the United States made larger net incomes from 1917 to 1920 than at any time before or since, but with the collapse in prices in 1920 they suffered losses greatly beyond those of other comprehensive groups. The collapse of farm prices was sudden and general; the recovery slow—so slow that unusual remedies had to be attempted.

Responsibility of the Government.—The blame for this state of affairs has been charged by the farmer against the government. It is claimed, and with reason, that the government has helped to create the state of unbalance as between the farmer and others. For example, the tariffs, of ancient and honorable ancestry, have been effective on factory goods, and with some few exceptions, ineffective on farm produce. The first demand of the farmer was in an increased tariff on farm produce which was promptly granted. Such increases were made in the emergency tariff act of 1921, and the more permanent act of 1922. The statistics for the years 1920 to 1923 show a distinct falling off in agricultural imports, yet the recovery in price, the essential purpose of the tariff, failed to occur. Being disappointed in the op-

eration of the tariff, the farmers were ready to try something more radical. They wanted, and very properly, some way out of the dilemma of poverty through the production of crops which had to be sold at prices ruinously low. The first plan devised to meet this requirement was that popularly known as the 'Equalization Fee' and embodied in the various McNary-Haugen bills. The McNary-Haugen plan passed Congress twice, but was vetoed each time by the President. There has been much discussion and difference of opinion as to the feasibility of putting this plan into effect in case it should be made a law.

The next most popular proposal was the so-called 'Debenture' plan. This consists of a payment, in the form of 'debentures'—i.e., of certificates which the government will accept in lieu of money in payment of tariff duties. In the Senate amendment to the farm relief bill passed in June, 1929, providing for the Federal Farm Board, it was proposed to pay a bounty equal to one-half the tariff. The amendment failed to pass. The Federal Farm Board organized during the special session of Congress in 1929, has broad powers which have enabled it to make extensive loans and also to promote stabilization corporations to take care of surplus commodities. The greatest boon to agriculture would be restricted output. The United States land policies in the past have encouraged more and more land use by farmers. It would undoubtedly be of benefit that the country should promote forestry, grazing and recreation, and discourage the use of marginal lands for crop production and steps have already been taken in these directions.

The Emergency Farm Mortgage Bill, signed by Pres. Roosevelt May 12, 1933, was designed to aid the farm mortgage situation. Its various provisions reduced the interest rates on Federal Land Bank loans, temporarily waived the requirement of payment on principal, provided funds for refinancing farmers' debts, and provided Federal Land Bank bonds for exchange or purchase for first farm mortgages. Both principal and interest on these bonds were guaranteed by the U. S. Government.

Early in 1934 the Farm Credit administration reported that farm mortgage loans averaging \$125,000 per county for the 3,072 counties in the United States had been made since May 1933. These loans, made by the land banks and from the land bank commissioner's fund, varied in amounts from \$30,000 to \$500,000 per county.

About \$65,000,000 was loaned by the Farm Security Administration in 1940 as rehabili-

tation loans to some 200,000 farm families, making a total of about \$474,912,850 loaned to some 829,000 families since 1935. See UNITED STATES, NEW DEAL.

Farnam, Henry Walcott (1853-1933), American political economist, was born in New Haven, Conn. He was president of the American Association for Labor Legislation (1907-10) and of the American Economic Association (1910-11); one of the editors of the *Yale Review* (1892-1911) and of the *Economic Review* (1911-12).

Farne Islands, Fearn, or Fern Islands or **The Staples**, an island group off the coast of Northumberland, England. Farn or House Island, the largest (16 acres), was the retreat of St. Cuthbert in the seventh century. Harcars and Longstone are specially associated with the heroism of Grace Darling.

Farnese Family, a famous Italian family which originated in the thirteenth century near Orvieto and was raised to importance by ALESSANDRO FARNESE, who became Pope Paul III. (1534-1549). He founded the duchy of Parma and Piacenza, and bestowed it upon his natural son, PIETRO LUGI, the first of a long line of princes of Parma lasting until 1731. Pietro was succeeded by his son OTTAVICO, and he by his son ALESSANDRO FARNESE (1545-92), who, after fighting at Lepanto (1571), became one of the most noted generals of the period. He was appointed governor of the Netherlands (being nephew of the Emperor Charles V.) in 1578; captured Brussels (1584) and Antwerp (1585), and forced Henry IV. of France to raise the siege of Paris (1590) and of Rouen (1592).

Farnese Palace, in Rome, on the left bank of the Tiber, was begun (1530) by Alessandro Farnese (Pope Paul III.), the architects being successively Sangalli, Michelangelo, and Della Porta (1580). The antique sculptures known as the Farnese Bull, the Farnese Juno, and the Farnese Hercules were so called either because of their discovery by Paul III. or their association with the Farnese Palace.

Faro, district of Southern Portugal, coincident with the former province of Algarve. It consists of a narrow, sandy coast strip, backed by higher ground, which culminates on the north in the Sierras, Monchique and Malhao. Area 1,937 sq. m.; p. 272,861.

Faro, one of the oldest 'banking' games at cards, which, under the name of 'pharaon,' attained great favor in the reign of Louis XIV. It is a favorite method of gambling in the Western United States. The interest of the game consists in betting on the order in which the cards will be drawn by the dealer from a box,

open at the top, in which a full pack is placed.

Faroe or **Faeroe Islands**, (Dan. *Færoerne*, 'sheep islands'), a group of Danish islands, in the North Atlantic, 190 m. n.w. of the Shetland Islands, and 250 m. s.e. of Iceland. The islands number twenty-one, of which seventeen are inhabited. Their total area is 540 sq. m. The largest of the group is Strömö (144 sq. m.), the other large ones being Osterö, Suderö, Sandö, Vaagö, and Bordö.

There are few safe harbors, and between the different islands run rapid and dangerous currents. The climate is insular, and the winters are mild. No trees are found on the islands, but excellent peat turf is cut, and in Suderö coal is obtained. The principal sources of wealth are sheep-rearing, fishing, and bird-fowling. The islands are governed by a Danish governor and a Landsting of 18 members elected for a term of four years. A resolution demanding complete independence was introduced into the local parliament in 1930 but was opposed by the party in power. The official language is Danish, but the people speak an Old Norse dialect. The capital is Thors-havn in Strömö; p. of islands, 18,000.

The Faroe Islands were colonized by Norwegians early in the ninth century and were held by Norway till 1380. Denmark became part owner in the latter year, and sole owner in 1814. Consult J. R. Jeaffreson's *The Faroe Islands*; Annandale's *The Faroes and Iceland*; York Powell's *Tale of Thrond of Gate*; Grossman's 'The Faroe Islands,' in the *Geographic Journal* for 1897.

Farquhar, George (1678-1707), British dramatist, was born in Londonderry, Ireland. His first play, *Love and a Bottle*, was given at Drury Lane in 1699. *The Constant Couple, or Trip to the Jubilee*, followed in 1700, and its success prompted the sequel, *Sir Harry Wildair* (1701). His best play, however, was *The Beaux' Stratagem* (1707). His remarkably able 'Discourse on Comedy' was published in 1702, in his volume of miscellanies entitled *Love and Business*. Editions of his works appeared in 1718-36 (2 vols.); 1775, with *Life* by Thomas Wilkes (3 vols.); 1840, edited by Leigh Hunt, and 1892, edited by Ewald (2 vols.).

Farragut, David Glasgow (1801-70), famous American naval officer, first admiral of the U. S. Navy, was born at Campbell's Station, near Knoxville, Tenn., on July 5, 1801. He was adopted by Com. David Porter, became a midshipman in the U. S. navy (1810), for several years served under Porter, on the *Essex*, and, though a boy, took an active and

gallant part in the fight between the *Essex* and the British frigates *Cherub* and *Phoebe* in the harbor of Valparaiso (Mar. 28, 1814). In 1826 he served on the receiving ship *Alert*, on which he conducted a school for the midshipmen; was on the *Natchez* in the harbor of Charleston, S. C., during the Nullification excitement of 1833, and in 1841 was commissioned as a commander.

During the Mexican War (1846-8) Farragut commanded the *Saratoga* in Com. M. C. Perry's squadron. In December 1861, he was chosen to command the important naval expedition against New Orleans. On Jan. 9, 1862, he was formally placed in command of the Western Gulf Blockading Squadron. The defences of New Orleans consisted principally of two forts on opposite sides of the Mississippi River at Plaquemine Bend. On April 16 Farragut's fleet anchored just out of range of these forts, which from the 18th to the 24th were vigorously bombarded, but were not seriously disabled by the mortar flotilla under Porter. Farragut then, in spite of the obstructions in the river and of the heavy fire from the forts, ran by these forts early on the morning of April 24th, with the loss of only one vessel. The Confederate flotilla of 13 gun-boats and 2 iron-clads above the forts was then overcome; New Orleans was forced to surrender (April 27), and on the 28th the two forts surrendered to Porter. (See NEW ORLEANS, BATTLE OF). Farragut then proceeded up the river, successfully ran past the batteries of Vicksburg (June 28), again passed them (July 15), engaged in blockade duty for several months, and in the spring of 1863 co-operated with General Banks in the operations against Port Hudson, which surrendered on July 9. On Aug. 5, 1864, he won the important battle of Mobile Bay. (See MOBILE BAY, BATTLE OF). He was successively made a rear-admiral (July 1862), a vice-admiral (December 1864), and an admiral (July 1866), receiving all three grades by special acts of Congress. Consult the *Life* by his son, Loyall Farragut, and that by Mahan in the 'Great Commanders Series.'

Farrand, Livingston (1867-1939), American educator, was born in Newark, N. J. From 1921-37 he was president of Cornell University. During the World War (1917-18) Dr. Farrand served under the International Health Board as director of tuberculosis work in France.

Farrar, Geraldine (1882-), American soprano singer, was born in Melrose, Mass., and received her musical education in Paris

and Berlin. Her debut was made as Marguerite in *Faust*, in the Royal Opera House, Berlin (1901). From 1906 until 1922 she was a member of the Metropolitan Opera Company, New York City, her roles including Marguerite, Butterfly, Manon, Mignon, Elizabeth, Tosca, Louise, Juliet, Gilda, Violetta, and Carmen. In 1916 she married Lou Tellegen, actor, whom she divorced in 1922.

Farrell, James Thomas (1904-), author, born in Chicago. The publication of *Young Lonigan* (1932), a study of boyhood in the slums of Chicago, immediately placed him in the first rank of contemporary American novelists. He also wrote *Gas-House McGinty* (1933); *The Young Manhood of Studs Lonigan* (1934); *Judgment Day* (1935); *A World I Never Made* (1936); *Father and Son* (1940). He was the only novelist placed on the Honor Roll of *The Nation* for 1935.

Farren, William (1786-1861), English actor, was born in London, and became manager of the Haymarket, the Strand, and the Olympic. Among his best impersonations were Sir Andrew Aguecheek, Sir Anthony Absolute, Kent in *King Lear*, and Old Parr.

Farrier, one who shoes horses, especially a soldier appointed by the troop commander for this duty.

Fars, or **Farsistan**, the mediæval name of Persia, now applied to the province lying n.e. of the Persian Gulf. The capital is Shiraz, and the port is Bushire. Fars contains the ruins of Persepolis and Pasargadæ; p. (est.) 750,000.

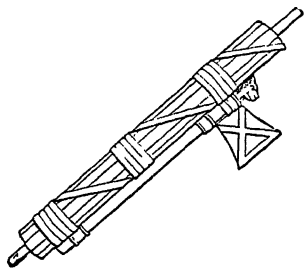
Farsan Islands, a small group of islands in the southeastern part of the Red Sea, off the coast of Yemen. They are centres of pearl fishing.

Farthing, a small English coin equal to a fourth of a penny. The old silver penny was deeply impressed with a cross and, being broken, made four farthings. Later silver farthings were coined, but in 1672, during the reign of Charles v., these were replaced by copper pieces. They are now made of bronze.

Farthingale (Old Fr. *vertugalle*, from Span. *verdugardo*, 'a hooped petticoat'), a hooped cage worn under the petticoat. The garment is presumably of Spanish origin, and appeared in France in 1530, and in England during Elizabeth's reign. Disused in the days of Charles II., it reappeared as the hooped petticoat of the 18th, and again as the crinoline of the 19th century.

Fasces, a bundle of rods of birch or elm with an axe in the middle, carried before the ancient kings of Rome, and later before the consuls, by each of twelve lictors. The rods

signified the power of punishment generally, the axes that of capital punishment in particular.



The Roman Fasces.

Fascia, in anatomy, the dense fibrous tissue which forms aponeuroses, tendons, and the sheaths of muscles and other parts. The superficial fascia connects the skin loosely with the underlying organs, allowing of free movement of the integument. The deep or aponeurotic fascia is dense, fibrous and inelastic. It provides sheaths for the muscles and broad surfaces for their attachment.

Fascia, or **Facia**, a narrow flat band, one of three, in buildings of the Ionic and Corinthian orders. Its position is immediately over the capital of the column.

Fasciation, a mal-formation of plants due to the flattening of a single stem or branch or to the union of several neighboring pedicels.

Fasciolaria, a genus of gastropods whose members have large, spindle-shaped, handsomely shaped shells, often called tulip-shells.

Fascism, from Italian *fascio* (bundle) and Latin *fascēs*, a political term denoting the governmental system of Italy. The name *Fascisti* was first adopted by the members of a patriotic organization founded in 1919 and directed by Benito Mussolini, at that time editor of *Il Popolo d'Italia*. The movement started in Milan and its adherents were mainly veterans of the World War. The party oath read: 'In the name of God and of Italy, in the name of all those who have fallen in battle for the greatness of Italy, I swear to consecrate myself exclusively and unceasingly for Italy's good.'

Italian soldiers returning from the war in 1918-19 found, in many places, red flags flying from government buildings. Soviet organizations established within; factories operated on a Communistic basis, and soldiers' uniforms and decorations the targets of insults and derision. At the Paris Peace Conference Italy had not gained her national aspirations; at home, the country stood on the brink of revo-

lution. Feeble ministries reshuffled their cabinets without any improvement in the domestic chaos. Ex-service men then began to organize in order to recover some of the things for which they had fought. D'Annunzio's spectacular adventure in Fiume aroused their nationalism in the winter of 1919-20, and in the following autumn the government's surrender of the factories in the great metallurgic region to the 'control' of Communism aroused the soldiers' patriotism. The elections of May, 1921, did not help matters, for fully 60 per cent.

newspaper plants were destroyed and strikes broken. In a last effort for mastery the radicals called a general strike for August, 1921. With cudgels and guns the Fascisti promptly forced strikers to return to work or took the places themselves. Thousands of workers then repudiated Communism and flocked to the Fascist labor unions, which condemned 'direct action' and advocated cooperation.

In October 1922 a great Fascist Congress met in Naples amid tumultuous enthusiasm. The Government attempted to compromise



A Fascist Demonstration.

of the middle-class voters stayed away from the polls, and the organized parties of Socialists and Catholics gained a great victory. Owing to lack of working majorities, successive ministries found it impossible to secure legislation by Parliament.

Local bodies of ex-service men began to adopt the symbol of the Roman *fascies* and, led by Mussolini, merged their organizations into the great national association of Italian youths in black shirts—and *Fascismo* was born. Radicals attacked Fascist processions and murdered the speakers. Retribution came swiftly. The Fascisti turned upon the disturbing elements; red flags were torn down, local Soviets were ousted with merciless force, Socialist halls and

with the powerful new party, offering cabinet portfolios. All offers were rejected; Fascism demanded to take over the whole government. The Facta cabinet resigned and the King invited Mussolini to Rome to form a new one. It was high time, for Fascisti in hundreds of thousands, from all parts of the country, were marching on Rome. The Government, in despair, ordered railroad tracks to be torn up; the King refused to sanction a proclamation of martial law and sent his private automobile to fetch Mussolini, who was received by his Majesty and in half an hour the control of Italy lay in the Fascist leader's hands. The old political order was swept away and a novel system of government was built on the ruins.

Under the dictatorship of Mussolini the administration of all the communes, formerly self-governing, was thereafter invested in a 'podesta' appointed by the government. A drastic press censorship law, passed in July 1924, was put rigorously into effect on January 1, 1925. The Fascist 'Charter of Labor,' promulgated in 1927, asserts the state's undisputed right to control all forces of production and forbids all strikes and lockouts. In 1928 an electoral bill abolished popular sovereignty and representative government as well as the principle of geographical representation. All political parties except the Fascist party have been declared illegal and the Fascist Grand Council has been made the 'supreme organ co-ordinating and uniting all the activities of the regime.' See ITALY.

During 1933 Fascism gained more than 70,000,000 adherents in Germany and Austria, and also made great gains in Eastern and central Europe. In Japan, Chile, Argentina, Peru, and China, also, Fascist organizations developed more strength. In Italy, the party membership on August 1, 1933, was about 2,500,000. After that date only those coming up through the youth organizations were permitted to enroll in the Fascist party. Fascism in 1938-41 showed increasing intolerance of minorities. Fascism in Italy fell with the 'resignation' of Mussolini July 25, 1943.

Consult Mussolini, *My Autobiography* (1928); L. Sturzo, *Italy and Fascismo* (1926); A. Turati, *A Revolution and its Leader* (1930); Foreign Policy Reports, *Fascist Rule in Italy* (April 15, 1931).

Fashion, in a general sense the most widely accepted or highly favored mode in dress, manners, speech, occupation, pursuit, or even manner of thought. Dress, perhaps, affords the most striking and tangible instances of the reign of fashion. For many centuries Paris set the fashion in women's clothes and London in men's. New York and other large cities now often modify these styles. The idiosyncracies of kings and queens, as well as the foibles of prominent men, poets, and others, have set fashions in dress and manners. Consult G. Hill's *History of Dress*; A. Challamel's *History of Fashion in France* (Eng. trans.); Planché's *Cyclopædia of Costume*; Robida's *Mesdames nos Aïeules*.

Fashoda, now known as Kobok, town, in the Egyptian Sudan, on the left bank of the White Nile, 470 m. from Khartum.

Fasti, in early Rome, 'lawful days,' or days on which business might be transacted, as opposed to *nefasti*, on which this was not per-

mitted. Such days were at first proclaimed by the priests, but later were set up in the forum, whence the word became equivalent to 'calendar.'

Fasting, the abstinence, entirely or in part, and for greater or less periods, from the use of food and drink. Few human beings have survived absolute abstinence from food for as long as twelve days, when water was also withheld. Fasting in a modified form is sometimes employed as a therapeutic measure. Fasting, as a religious practice, is of early origin. Partial or entire abstinence from food, or from certain kinds of foods, at stated seasons, prevailed among the Parsees, Hindus, Egyptians, Assyrians (Jonah iii. 5), Greeks, and Romans, and, in fact, the custom was often regarded as an almost essential concomitant of piety and saintliness. It was likewise a prominent element in the religious life of the Jews. Christ Himself lays down no express rules as to fasting, but the church early commenced to institute seasonal fastings for its members. In the Roman Catholic Church there are the great fast of Lent, the quatermonth fasts of three days in one week recurring four times a year, and Friday's abstinence from flesh foods. Among the Anglicans and Protestants generally the custom is regarded as praiseworthy rather than obligatory. In some New England States an annual 'Fast Day' is observed, a custom of Puritan origin.

See also MOHAMMEDANISM; RAMADAN.

Fastnet Rock, islet off the s. w. coast of Cork, Ireland, 4 1-2 m. s. w. of Cape Clear. Its revolving white light is visible for eighteen miles.

Fat, a substance of both animal and vegetable origin, white, greasy, and melting easily. (See OILS.) Chemically, fats and oils, whether derived from animals or plants, are hydrocarbons, consisting approximately of 79 parts of carbon, 11 of hydrogen, and 10 of oxygen. The three principal fats are stearin, palmitin, and olein; but in nature no one of these is found alone, all natural fats and oils being mixtures of two or three simple fats or compounds of glycerin with fatty acids. Animal fat consists of oil globules contained in thin envelopes, and varying in composition not only in different animals but in different parts of the same animal. Vegetable fats occur in many plants, chiefly in the seeds. Thus some nuts contain over 50 per cent. of oil. Of the cereals, oats, with 6 per cent., are richest in fatty substances. The fat of the living body is derived chiefly from the hydrocarbons of the food, but also from the albuminates and car-

bohydrates, so that in health, should a greater quantity of any carbon-containing food be taken than is required for the daily needs of the body, the excess may be stored up in the form of fat. (See DIGESTION and OBESITY.)

As a food, fat produces, by rapid oxidation, both heat and energy, and it can be taken much more freely in cold than in warm climates. Fat is useful in the preparation of other foods. As it can be heated to a temperature of 500°F. without boiling, it is employed in cooking fish and meat. See OILS; FAT.

Fatalism signifies the belief that the issue of all events is so fixed or predetermined by fate or divine decree that no effort of man can avail to alter it. Its relation to human life and action fatalism is thus an extreme and external form of determinism, which must be clearly distinguished from determinism properly so called (see DETERMINISM) since it not merely regards the events of man's life as determined, but deprives man's active will and effort of any effective part in their determination.

Fata Morgana, the Italian name for a striking mirage observed in the Strait of Messina. The mirage is often duplicated, one image being inverted.

Fatehgarh, town, United Provinces, India, capital of the district of Farukhabad. In 1857 during the Indian mutiny, the entire European population was massacred; p. 13,000.

Fatehpur-Sikri, town, United Provinces, India, 23 m. w. of Agra. It was the former capital of the Mogul empire, founded by Akbar in 1570, but is now in ruins, of which the tomb of Selim Chisti is one of the most magnificent in India; p. 5,000.

Fates. See **Moirae**.

Father. See **Family**.

Fatherhood, The Divine. Fatherhood is the simple yet sublime metaphor used to express the distinctively Christian view of God in His relation to man. Partial anticipations of the conception are found in ethnic religions, but these hardly go beyond the idea of God as the progenitor of all things. The new and unique feature in the teaching of Jesus on the subject is that with Him the idea of God's fatherhood becomes the key to all His dealings with men, and while He vastly enriches the idea, He excludes none from its embrace.

Fathers, Apostolic. See **Apostolic Fathers**.

Fathers of the Church, a name under which are included those authors of the early Christian centuries who are recognized as high authorities in matters of the Church's faith; in brief, the ancient classics of Christian theolo-

gy. The principal qualifying characteristic of any particular writer included in the class would seem to be that, as an expounder or defender of Christian doctrine, he was in agreement with the essential teaching of the Church. It is most convenient to bring the age of the fathers well within the first period of church history, say from 100 to 700 A.D. Excluding the apostolic fathers, we may enumerate the fathers proper thus: (1) Ante-Nicene writers—Irenaeus, Tertullian, Justin, Origen, Clement of Alexandria, Cyprian, and Gregory Thaumaturgus, of whom the second and sixth wrote in Latin, the others in Greek; (2) post-Nicene writers—Athanasius, Basil, Chrysostom, Gregory Nazianzen, Cyril of Jerusalem, Gregory of Nyssa, Epiphanius, Cyril of Alexandria, pseudo-Dionysius, and Joannes Damascenus all writing in Greek, and Ambrose, Jerome, Augustine, Gregory the Great, Hilary, and Leo the Great, in Latin. The first four named in each section of the post-Nicene authors are specially recognized as the *doctores ecclesiae* in the Greek and Roman Catholic Churches respectively. The study of the fathers is called patristics or patrology. Collective editions are J. P. Migne's in 383 vols. (1844 seq.); *Nicene and Post-Nicene Fathers* (1st ser., 14 vols., 1887-92; 2d. ser., 14 vols., 1890-1900).

Father's Day, the third Sunday in June, is quite generally observed as a day to do honor to fatherhood. The idea was conceived about 1910, but it is only within the last few years that there has been any general observance.

Fathom, a measure of six ft., used for regulating the length of a cable and to divide the sounding line. In the United States and British charts, soundings are usually marked in fathoms, though, in the case of shallow water, feet are employed.

Fatigue, in physiology, the flagging or fatigue of muscle which largely depends on the poisoning of the muscle cells by their own waste products. If the muscle is washed with blood or with salt solution its energy is in great measure restored. The unsheathed end-plates of nerves yield to fatigue even sooner than do muscle cells and like them are poisoned by muscular waste-products. In materials, the term is used to denote the weakening effect produced, chiefly in metals, by a repeated succession of severe stresses. It is supposed to be the result of a molecular change in the metal, due to vibration or a continually varying strain.

In military usage the term is applied to a soldier's work when not connected with the use of arms—e.g. fatigue duty. Similarly,

fatigue-dress is the uniform worn when so engaged.

Fatimah or **Fatima**, (600-632), a daughter of Mohammed by his wife Khadija. She is one of the four perfect women of Islam, and married Ali.

Fatimides, an Arab dynasty, which reigned over Egypt, North Africa, and Syria, from 909 to 1171 A.D. Its founder claimed to be descended from Fatimah, the daughter of Mohammed, and wife of Ali. Consult Poole's *Mohammedan Dynasties*.

Fatshan, or **Fuhshan**, town, China, in Kwang-tung province, on the West River; 10 m. s.w. of Canton. It is a busy manufacturing and commercial centre, known as 'the Birmingham of China,' and produces silk, porcelain, embroideries, iron and steel goods; p. 500,000.

Fatsia, a genus of half-hardy shrubs belonging to the order Araliaceæ. The most important species is the *F. papyrifera* of Formosa, the source of the celebrated rice paper of the Chinese.

Fatty Acids, a series of saturated hydrocarbon derivatives, having the general formula $C_nH_{2n+1}COOH$, in which the carbon atoms are arranged in open chains. Fatty acids are in general prepared either by the oxidation of the corresponding alcohols or by the hydrolysis of the alkyl cyanides.

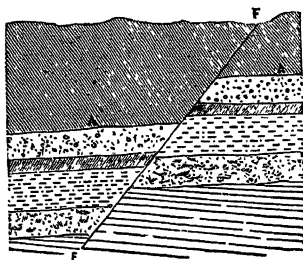
Fatty Compounds comprise the paraffin series of hydrocarbons, of the general formula C_nH_{2n+2} and their derivatives, and are distinguished by having the carbon atoms present in them arranged in open chains. They get their name from the fact that the common fats are included in their number.

Faucit, Helena Saville, afterwards **Lady Martin** (1820-98), English actress, made her debut at Covent Garden in 1836 as Julia in *The Hunchback*, and rapidly reached the first position in Macready's company. By far the greatest actress of her time, Helena Faucit achieved success in characters of very varied types. Almost unrivalled as Lady Macbeth, she was a Juliet of surpassing charm, a Rosalind of delightful archness and grace, and an Antigone of tragic strength. See *Biography* by Sir Theodore Martin (1900), and *Actors and Actresses of Great Britain and the United States*, ed. by Matthews and Hutton (1886).

Faulhorn, famous view-point (8,803 ft.) in the Bernese Oberland, Switzerland, between the valley of Grindelwald and the Lake of Brienz.

Faulkner, Charles James (1806-84), American politician, born in Berkeley co., Va. He served several terms in the Virginia legisla-

ture, where, in 1832, he advocated emancipation in that state, and in 1848 introduced a bill, which was passed, sent to Congress, and became the frame-work of the well-known Fugitive Slave law of 1850. He was a member of Congress from 1851 to 1859, in which year he was appointed minister to France, but, for influencing Louis Napoleon in behalf of the Confederacy, was, in 1861, recalled and imprisoned in Fort Warren, Boston.



Normal Fault.

The similarly shaded strata, AA, show the amount of displacement; FF, fault.

Faults, in geology, are fractures which traverse the rocks of the earth's crust. Of the masses on opposite sides of a fault one has been uplifted, the other depressed, and they are in consequence known respectively as the *upthrow* and the *downtthrow*. The amount of displacement varies from a few inches up to ten thousand or twelve thousand feet. Earthquakes are particularly numerous near great faults, and are believed to be due to sudden slipping of the rocks.

Faun. See **Faunus**.

Fauna the name given collectively to the animal life of any area, whether natural or artificial.

Faunce, William Herbert Perry (1859-1930), American educator, born at Worcester, Mass. In 1889 he became pastor of the Fifth Avenue Baptist Church in New York City, where he remained until he became president of Brown University in 1899. He retired in 1929 and was president of the World Peace Foundation.

Faunus, in Roman legend, was the third king of the Laurentes. He was worshipped as the god of shepherds and of agriculture, and also gave oracles. When Greek mythology was introduced into Italy, Faunus was identified with Pan. The name of faun is also given in a general way to statues of any rural god.

Fauquier, Francis (1704-68), colonial gov-

ernor of Virginia from 1758 until his death. Although sympathizing with the colonial grievances, he opposed action, dismissing the house of burgesses for passing Patrick Henry's Stamp Act resolutions, in 1765, and refusing to convene a new house to send delegates to the Colonial Congress.

Faure, François Félix (1841-99), president of the French republic from 1895 until his death.

Faure, Jean Baptiste (1830-1914), dramatic baritone, one of the greatest France has produced, was born at Moulins. He was very successful at the Opera Comique, and, after joining the Grand Opera in 1861, acquired a European reputation by his interpretations in *L'Africaine*, *Faust*, *La Favorita*, *Don Carlos*, etc. M. Faure is also known as a composer of sacred music, his sacred song, *Les Rameaux* (*The Palms*), being a great favorite in the U. S.

Faust is a name around which many tales of supernatural powers, associated with Simon Magus, Paracelsus, and others, have crystallized. There is a good deal of evidence to show that there lived in the 16th century a Dr. Johannes Faustus. Strange stories about his life were first gathered in a chapbook printed by Johann Spies in 1587. This book was very popular. In England the fate of Faust was dramatized very early (about 1589) by Marlowe, and English troupes of actors brought this play to Germany, where it became the source of many puppet plays. Goethe's *Faust*, of which the earliest scenes were written before 1775, while the whole was completed shortly before his death, was published in 1833. Lenau's *Faust* (1836) is a noble work of poignant sadness, a lyric poem rather than an epic drama. Heine characteristically made Faust the subject of a ballet, *Der Doctor Faust, ein Tanzpoem* (1851). *Faust* is the title of operas by Berlioz and Gounod. See works on Faust by O. Pniower (1899), and J. Minor (1901). For the Faust legend, see Faligan's *Histoire de la Légende de Faust* (1888). For a bibliography (2,714 items) of all works bearing on Faust, see K. Engel's *Zusammenstellung der Faustschriften* (1885).

Faust, Johann. See *Fust*.

Faustina, Annia Galeria Faustina (104-141 A.D.), married the emperor Antoninus Pius when he became emperor in 138 A.D.; she received the title of Augusta. ANNIA FAUSTINA (c. 130-175 A.D.), daughter of the above, and wife of M. Aurelius, the emperor.

Favart, Charles Simon (1710-92), French dramatist, born in Paris, and became director of the Opera Comique before he was forty. His best plays are *La Chercheuse d'Esprit* (1741),

Annette et Lubin (1743), *Ninette à la Cour* (1755), *Les Trois Sultanes* (1761), and *L'Anglais à Bordeaux* (1763). His collected plays were first published in ten volumes (1763-72) and his *Memoires et correspondance litteraire* posthumously (1809). Consult *Life* by Font (1894).

Faversham, town and seaport, England, in Kent; 9 m. w. of Canterbury. There are remains of an abbey founded by King Stephen and the parish church contains tombs of King Stephen, his wife Matilda, and his son. Historically the town dates back as far as the 9th century; p. 10,870.

Faversham, William (1868-1940). American actor, was born in England. He was educated in England and went to the United States in 1888, five years later becoming a member of the Empire Theatre Company of which he afterwards became leading man. He played in Shakespearian rôles and was perhaps at his best in drama and tragedy.

Favignana, one of the Egadi (Aegates) Islands, off the west coast of Sicily. Off this island the Romans defeated the Carthaginians in 241 B.C.; p. about 6,500.

Favonius, in Roman mythology the name given to the west or southwest wind which blew in spring. It was identified with the Greek *zephyrus*.

Favonius, Marcus (c. 42 B.C.), Roman public man, a contemporary of Cicero and of Cato of Utica, whose stoical habits he copied so closely as to be called 'Cato's ape.'

Favre, Jules Claude Gabriel (1809-80), French statesman, was born in Lyons. He studied for the bar in which profession he had a brilliant career, his reputation being finally established by his defence of Orsini (1858). As minister of foreign affairs under the republic, he advocated desperate resistance to the Germans; and on being sent to negotiate with Bismarck, met the latter's demands with the famous answer, 'Not an inch of our territory, not a stone of our fortresses.'

Favus, a skin disease, due to the presence of a fungus (*Achorion schonleinii*). It is highly contagious and exceedingly intractable. In human beings it may occur in any part of the skin, but is most commonly found on the scalp, resulting in loss of hair, or complete baldness if unchecked.

Fawcett, Edgar (1847-1904), American writer, was born in New York City. He wrote several dramas, of which *The False Friend* (1880) was the most successful. His volumes of poems include *Poems of Phantasy and Passion* (1878), *Song and Story* (1884), *Romance and*

Revery (1886), and *Songs of Doubt and Dream* (1891). His works of fiction deal principally with life in New York, and include *A Hopeless Case* (1881), *New York: a Novel* (1898), and *Voices and Visions* (1903). In 1889 he published *Agnosticism, and Other Essays*.

Fawcett, Henry (1833-84), English economist and statesman, was born in Salisbury, Wiltshire. In 1863 he published *Manual of Political Economy*, which led to his appointment to the professorship of political economy at Cambridge in the same year, a post which he held till his death. He became postmaster-general (1880) and introduced several practical reforms, such as the parcels post (1882), and devised many schemes to encourage thrift. As an economist he was content to be a faithful expositor of Mill. Consult Stephen's *Life of Henry Fawcett*.

Fawcett, Col. P. H. (1867-1925), Br. explorer, entered the virgin Brazilian jungles near Fort Bakairi, Matto Grosso, in 1925 and never returned. He was accompanied by his son, Jack, and Raleigh Rameil. They were seeking the ruins of a white civilization said to have flourished in the interior in pre-Columbian time. Many reports of Fawcett's death or of his reappearance at frontier settlements came from the jungle country. His friends believed he and his party were murdered by savage tribesmen.

Fawkes, Guy (1570-1606), English conspirator, son of Protestant parents, was born in York. He became a zealous Roman Catholic, and served in the Spanish army (1593). Though not consulted in the devising of the Gunpowder Plot, he was intrusted with the chief part in its execution. The plot was discovered, however, and he was arrested and hanged. See GUNPOWDER PLOT.

Fay, András (1786-1864), Hungarian author and poet, is best known for his novel *Javor, the Doctor* (1855).

Fay, Theodore Sedgwick (1807-98), American author and diplomat, was born in New York City. He entered journalism at an early age, becoming associate editor of the *New York Mirror*.

Fayal, an island of the Azores, w. of Pico; area, 68 sq. m. It is quite mountainous and has a fertile soil and a good climate; p. 30,000.

Fayette, city, Missouri, county seat of Howard co. Bricks and tile are the chief articles of manufacture. It is the seat of Central College for men and women, under the control of the Methodist Episcopal Church, South; p. 2,608.

Fayetteville, city, Arkansas, county seat of Washington co. It is the seat of the University of Arkansas and a Commercial College, has a U. S. Experiment Station, an opera house, and a Masonic temple. It was the scene of several small engagements in the Civil War and the battles of Prairie Grove and Elkhorn (Pea Ridge); p. 8,212.

Fayetteville, city, North Carolina, county seat of Cumberland co. The leading manufactures are cotton goods, silk cloth, knit underwear, flour and cottonseed oil. It is a wholesale distributing point for commercial fertilizers, and trucking point for northern markets. It is the seat of a State normal college for negroes; p. 17,428.

Fayetteville, town, Tennessee, county seat of Lincoln co. It is the seat of Bryson College; p. 4,684.

Fayum, province, Egypt, formed by a natural depression in the hills on the west side of the Nile; area, 493 sq. m. It is an oasis of the Libyan Desert. In ancient times it was the seat of worship of the crocodile-headed god Sobk. The district is renowned for the important papyri there discovered. The chief town is Medinet-el-Fayum; p. 552,581.

Fazy, Jean James (1796-1878), Swiss publicist, was born in Geneva. He founded the Radical newspaper *Revue de Genève*.

F.B.I., Federal Bureau of Investigation. A U. S. New Deal agency.

F. C. A., Farm Credit Administration. A U. S. New Deal agency.

F. C. C., Federal Communications Commission. A U. S. New Deal agency.

F. D. I. C., Federal Deposit Insurance Corporation. A U. S. New Deal agency.

Fealty, a feudal custom which binds a tenant to his feudal lord. It is still an incident of tenure in England, but is no longer exacted.

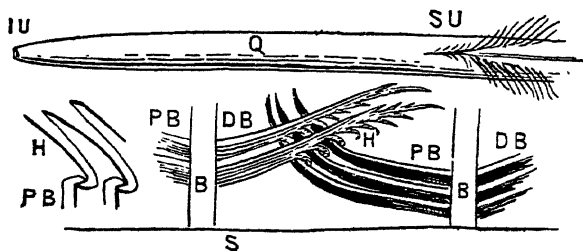
Fear, a primary emotion characterized by a specific pain or misery, some disturbance amounting at times to paralysis of the active energies, and a temporary establishment of a fixed idea of impending evil. According to some authorities, fear presupposes the necessity for practical readjustment to environment, and arises when, through the temporary disorganization due to some suddenly emerging circumstance or danger, adjustment is impossible. Bain describes the emotion as originating in the apprehension of coming evil. Spencer describes fear as being essentially the revival on a given stimulus, of past experiences of pain. There is no fundamental inconsistency in these views. Fears may vary from instinctive surprise or wonder to terror. In the

mildest form, there is some interference with the organic functions; in the extreme form, there is a total functional derangement. Intellectually, the mind becomes concentrated on some single idea, which subdues everything to itself. Generally, fear in the individual is the product of danger, and instinctive fear is the product of race-experiences of danger. For critical discussion of theories see Stout's *Manual of Psychology*; for physical signs, Darwin's *Expression of the Emotions in Man and Animals* (2d ed. 1890); for concrete presentation of massive effects of fear, Stephen Crane's *Red Badge of Courage*.

Fear, Cape, a promontory off the southern coast of North Carolina extending into the Atlantic Ocean. Its surrounding waters are usually turbulent and its vicinity is dreaded by navigators.

pendages of birds, occurring nowhere else throughout the animal kingdom. A feather generally consists of a central axis or scape, the upper part of which bears the lateral outgrowths which constitute the vane. The axis is divided into a lower region, the hollow calamus or quill, and an upper, the solid rachis. At the sides of the rachis are placed two rows of barbs, each of which bears two rows of secondary processes or barbules, the barbules of each barb being locked to those of the next by means of hooklets and folds. As a result of this interlocking arrangement the vane of the feather forms a strongly resistant surface, admirably adapted for flight. The chief uses to which feathers are put are for pens, cushions or beds, and for adornments. See BIRDS; OSTRICH.

Feather Star, any of the living crinoids, especially the rosy *Comatula rosacea*, familiar



The Structure of a Feather.

Q, Quill; s, shaft; IU, inferior umbilicus; SU, superior umbilicus; B, barb; DB, distal barbule; PB, proximal barbule; H, hooklets.

Feast, a term applied to days or seasons set aside for the celebration of some joyous event. Such celebrations were widespread and originally were generally of a religious character.

Christian love feasts or *agapae*, symbols of social equality, at which the Eucharist was celebrated, were founded on Greek and Roman precedents, were common in the early church but were discontinued, owing to misuse, after the 4th century. The tendency of the Reformation was to sweep away the greater number of feast days or days of holy obligation and Sunday alone was retained by all the churches.

Feather Grass (*Stipa pennata*), a genus of hardy, beautiful perennial grass, long cultivated in gardens.

Feather River, river, California, tributary of the Sacramento, rises in the Sierra Nevada range. It flows for a length of about 225 m. through a rich gold producing country.

Feathers, the characteristic epidermal ap-

on the Atlantic coast of Europe. See CRINOIDEA.

Febiger, John Carson (1821-98), American naval officer, was born in Pittsburgh, Pa. In the Civil War as commander he commanded the steamer *Kanawha* in the West Gulf Blockading Squadron (1862-3). In May, 1868, he became a captain, and in August, 1874, a commodore. He commanded the Washington Navy Yard (1876-80); and in 1882 he became a rear admiral and was retired from active service.

Febrifuge, in medicine, a therapeutic agent employed to overcome febrile symptoms. As a high temperature is only one indication of the febrile state, the term febrifuge has a wider significance than antipyretic.

February, the second month of the calendar year. It ordinarily contains 28 days, but in leap year it consists of 29. Its ancient name *Februarius* was derived from februaire, to

purify, or from *Februa*, the Roman festival of general expiation.

Fécamp, town and seaport, France, in the department of Seine-Inférieure, on the English Channel. The church of the Benedictine abbey, founded in the 11th century, was restored in 1895. Over a million and a half bottles of the liqueur 'Benedictine,' formerly a product of the abbey, are made in the town each year. The harbor, recently much improved, is a centre for vessels engaged in deep-sea fishing; p. 17, 184.

Fechner, Gustav Theodor (1801-87), one of the leading philosophical thinkers of Germany, was born in Gross-Särchen, near Muskau, in Lower Lusatia, but after 1817 lived mostly in Leipzig, where from 1834 to 1839 he was professor of physics. The two works in which his general metaphysical views are set forth, entitled *Nanna* and *Zend-Avesta*, appeared in 1848 and 1851, respectively. Fechner is best known, however, as the founder of psychophysics. He also won a reputation as a writer of humorous essays and poems, under the name of Dr. Mises.

Fechter, Charles Albert (1824-79), Anglo-French actor, was probably born in Paris. Going to London early in the 'sixties, he first essayed the name-part in *Ruy Blas* with brilliant success. He visited the United States twice (1869, 1872) before finally settling there. He made his first appearance in New York at Niblo's Garden (Jan. 10, 1870) as *Ruy Blas*, and was later enthusiastically received in other American cities. Consult Field's *Life*.

Federal Council of the Churches of Christ in America, The, was organized by the Interchurch Conference on Federation in New York City in 1905, and held its first regular meeting in Philadelphia in 1908. Its chief purpose is the correlation and unification of the 28 Christian denominations which form the constituency of the Council; but it claims no authority over those churches, nor does it formulate creeds and forms of worship. It now includes most of the major Protestant denominations of the United States. The Council is responsible for a series of religious broadcasts, over a nation-wide hook-up. National headquarters are in New York City. Consult *Reports*; *Handbook of the Churches*; *Church Federation* (1905); *The Church of the Federal Council* (1915); *Social Work of the Churches*. F. E. Johnson, ed. (1930).

Federal District, a district set apart for the federal government of various states. The District of Columbia of the United States may be termed a Federal District.

Federal Government. See **Federation**.

Federalist, The, was the name of a series of essays which appeared in *The Independent Journal*, New York, between Oct. 27, 1787, and April 2, 1788. They were afterward printed in book form under the title of *The Federalist*, and are eighty-five in number—the last eight being added in the collected edition. They were written under the pseudonym 'Publius,' and although the authorship of some of the essays have caused much discussion, it is certain that they were inspired by Alexander Hamilton and were the productions mainly of Hamilton himself, of James Madison, and of John Jay. They have subsequently been regarded as a brilliant and searching exposition of the Constitution, and have even been recognized by the law courts as the most important interpretation of the American Constitution. The most useful edition is that edited by Paul L. Ford, containing a full index.

Federalists, in American political history, a name first applied to those who advocated the adoption of the Federal Constitution of 1787; and later applied to those who, after the development of national parties in President Washington's first administration, followed the leadership of Alexander Hamilton, rather than of Thomas Jefferson, the leader of the Democratic-Republicans. The Federalists stood for centralization, for the nationalization of the Federal Government, and for a broad construction of the Federal Constitution. President Washington himself, though he attempted to stand aloof from parties, was essentially a Federalist.

The actual organization of the National Government was the work of the Federalists, who thus rendered a service of inestimable value. But the opposition, under the skilful leadership of Jefferson, gradually gained strength. The Federalists opposed the restrictive system and the War of 1812, and owing to the Hartford Convention became utterly discredited. Finally, in the Presidential election of 1820, not a single Federalist electoral vote was cast, and the Federalist party disappeared from national politics. Chief Justice Marshall, a Federalist, perpetuated those principles in the interpretation of the Constitution. See **HARTFORD CONVENTION**; **UNITED STATES, History**.

Federal Reserve Act. See **Banking; United States**.

Federal Reserve Board, for the supervision of the Federal Reserve System of the United States, was created by Act of Dec. 23, 1913, and was formally organized on Aug. 12, 1914. It consists of the Secretary of the Treasury and

the Controller of the Currency *ex officio*, and five other members appointed by the President, with the approval of the Senate, to serve for ten years. Two of these are designated by the President as governor and vice-governor of the Board.

By the terms of the Federal Reserve Act the Board exercises general supervision over all Federal Reserve banks, and is given wide authority in regulating their affairs. The headquarters of the Federal Reserve Board are in Washington, D. C., and *The Federal Reserve Bulletin* is its official publication. The seven members constituting the first Board were: William G. McDoo, John S. Williams, Charles S. Hemlin, Frederic A. Delano, Paul M. Warburg, W. P. G. Harding, and Adolph C. Miller. The secretary was H. Parker Willis.

See **BANKING: UNITED STATES.**

Federal Trade Commission, U. S., a non-partisan commission created by Act of Congress, approved Sept. 26, 1914. It is composed of five members, who are appointed by the President of the United States for seven years each, and who are prohibited from engaging in any other business, vocation, or employment during their term of office.

The Commission is empowered and directed to 'prevent persons, partnerships, or corporations, excepting banks and common carriers subject to the acts to regulate commerce, from using unfair methods of competition in commerce.' The members of the first Federal Trade Commission were: Joseph E. Davies (chairman), E. N. Hurley (vice-chairman), W. J. Harris, W. H. Parry, and George Rublee.

Federated Malay States. See **Malay States, Federated.**

Federation and Federal States. Federation is the more or less permanent union of two or more states which, while retaining their autonomy, transfer the management of certain matters of common concern, particularly defence and foreign affairs, to a government representing all the federal states. The different forms of political federation may be considered under four general types:

1. The lowest type of federation occurs when the bond of union is the personal link created by the accidental circumstance that the ruler or monarch of two or more communities is one and the same person. The recently dissolved union of Sweden and Norway was of this order.

2. Ascending a little higher in the scale, we come to that type of union which is created when the fortunes of one country become linked to those of another by the imposition or acceptance of a common authority, regardless

of dynastic changes. Of this kind was, *de jure*, the connection between Scotland and England after the union in 1707.

3. We now come to a third and much more complex type of union, to which the name *confederation* in a restricted sense is sometimes applied. This occurs where a number of independent communities voluntarily unite together for certain specified purposes, which involve not merely alliance, but actual co-operation through permanently established organs. As an example of this form of union the United States under the Articles of Confederation may be cited, where each state retained its sovereignty, freedom, and independence, and every power not expressly delegated to the Congress, and where the purpose of union was common defence against foreign foes.

4. Federation, in the strictest sense, not only has a complete political organization—legislative, executive, and judicial—but in this organization it recognizes no distinction of states. Within its own proper sphere the government of the federal authorities is irresponsible and absolute. On the other hand, even the closest type of federal union is clearly to be distinguished from the 'unitary' or simple state by the fact that the autonomous rights of the different members do not depend upon the permission or authority of the central government. The powers of the State of Massachusetts or of Ohio flow as directly from the Constitution itself as do the powers of the central government at Washington. Finally it may now be taken as fairly settled that no right of secession exists in a true federal state.

See **CONSTITUTION; DEMOCRACY; GOVERNMENT; SOVEREIGN.**

Consult Burgess' *Political Science and Comparative Constitutional Law*; Hart's *Introduction to the Study of Federal Government*; Bryce's *Holy Roman Empire* (new ed. 1904); Freeman's *History of Federal Government*; Adams and Cunningham's *The Swiss Confederation*; Bryce's *The American Commonwealth* (new ed. 1912); Moore's *The Commonwealth of Australia*; Brand's *The Union of South Africa* (1909).

Federation of Arts, American. See **Arts, American Federation of.**

Federation of Labor, American. See **Labor, American Federation of.**

Fee. See **Fees.**

Fee, otherwise called **Fief, Feod, or Feud** (Latin *feudum*), signified originally an estate in land held of another, but now applied to one which descends to heirs—in other words, an estate of inheritance. It may either be *fee simple* where the property is granted to A and

his heirs, or *fee tail*, where a special class of heirs is designated, as in the case of a grant to A and the heirs male of his body (see *ESTATES*). A fee simple estate may be either *absolute* or *qualified*. See *TENURE*.

Feeble Minded. See **Mental Deficiency.**

Feeding Stuffs. This term is applied to all kinds of food materials used for farm animals, and includes fodder or forage, grasses and their products, and many commercial by-products. For the most part, feeding stuffs are of vegetable origin, although ground meat, bone and dried blood are used to some extent; and by-products from the dairy, as skim milk, buttermilk, and whey, find extensive use, especially for young animals.

Feeding stuffs may be classed in a general way as coarse fodders, also called 'roughage,' such as hay, straw, corn fodder, silage, and similar coarse materials, and concentrated feeds or 'concentrates,' which include such materials as the cereal grains, leguminous seeds, and the commercial by-products.

Feeding stuffs differ much in chemical composition, but are all made up of various proportions of water, protein, or nitrogenous material, fat nitrogen-free extract, crude fibre, and ash. Generally speaking, the fat content of feeding stuffs is low, although some materials, like soy beans and peanuts, contain quite large percentages. The most expensive nutrient in feeding stuffs is protein, and the proportion of this constituent largely determines the value, especially of the more concentrated feeding stuffs. Consult the *Bulletins* of the U. S. Department of Agriculture, especially *Bulletin 22* and *Bulletin 77*.

Feehan, Patrick A. (1829-1902), American archbishop, was born in Tipperary, Ireland. He was bishop of Nashville, Tenn., from 1865 to 1880; and became the first archbishop of Chicago in 1880.

Feeling, as limited to emotion, is a legitimate specialization of the term. Feeling is the accepted name for the fundamental fact of consciousness as experiencing pleasure or pain. The word is also used less accurately as synonymous with sensation. See *EMOTION*; *TOUCH*.

Fees may be defined as the charges made by lawyers, physicians, schoolmasters, and members of other professions for services rendered.

As to agreements between an attorney and his client regarding fees, see *CHAMPERTY*.

Fee Simple, an estate of inheritance held by the grantee without limits and unconditionally. It differs from the fee tail in being transmissible by the owner. Fee simple is of feudal origin. In English law it is an estate of inheritance re-

ceived from the sovereign, and vested in the owner. In the United States it is an estate of inheritance which belongs to the owner, and which may be transmitted to his heirs unconditionally. A fee simple may be *absolute* or *qualified*, but its principal qualities of heritability and alienability cannot be invalidated or destroyed. See *CONDITIONAL LIMITATION*; *ESCHEAT*; *ESTATES*; *EXECUTORY DEVISE*.

Fee Tail, an estate of inheritance in land which can descend only to the issue of the tenant. An estate limited to a man and the heirs of his body is an estate in *tail general*; if to the heirs of his body by a particular wife, it is an estate in *special tail*; if to a man and his male heirs only, or his female heirs only, it is an estate in *tail male*, or *tail female*. In most of the United States, estates tail have been abolished by statute. See *ESTATES*; *REAL PROPERTY*.

Feet. See *Foot*.

Fehling's Solution is a deep blue liquid, containing cupric hydroxide dissolved in a strongly alkaline solution of potassium tartrate. It is used for the detection and estimation of sugars, such as glucose, by which it is reduced, a red precipitate of cuprous oxide being formed.

Feijoo Montenegro, Benito Jeronimo (1676-1764), Spanish man of letters, a writer of the French school, fashionable in Spain with the coming of the Bourbon kings.

Feis. The Irish *feis* or *fess* was an assembly or convention, such as that which met at Tara in the reign of Aed, son of Ainmire (572-99), to discuss, *inter alia*, the banishment of the *filid* or bards. The modern Feis-ceoil—i.e., assembly of music—is a society, founded in Dublin in 1879, for the encouragement of native music.

Feisal (1885-1933), King of Iraq, with the aid of the romantic Lawrence of Arabia, carved an Arabian kingdom from part of the ruins of the Turkish Empire during the World War. He was chosen King at a plebiscite in 1921. Toward the end of his reign, he was accused of responsibility for a massacre of Syrian Christians. He was succeeded by his son, Prince Ghazi. England relinquished her mandate over Iraq in 1932.

Feith, Rhijnvis (1753-1824), Dutch poet, was born in Zwolle. Though he achieved decided success with his novels *Julia* (1783) and *Ferdinand and Constantia* (1785), his chief triumphs were won in tragedy—*Lady Jane Grey* (1791), *Inez de Castro* (1793), *Thirsa* (1784), and the *Patriots* (1785) being his principal pieces.

Feldkirch, town, province Vorarlberg, Austria; 20 m. s.w. of Bregenz. It is situated between the two narrow rocky gorges through which the Ill River flows into the Rhine valley, and is of great military importance, as it commands the entrance into the Tyrol from the west; p. 11,900.

Feldspar, or **Felspar** (German *Feldspath*, 'field spar'), a general term in mineralogy for the most important rock-forming group of minerals. The feldspars are all anhydrous silicates of alumina, containing either potash, soda, or lime alone, or two of those bases together. They have a hardness between 6 and 7—that is to say, they can be scratched with a good penknife. Their specific gravity is about 2.6. They are all, as a rule, white or gray in color, but sometimes pink or green from the presence of impurities; and have a good cleavage, yielding smooth surfaces when broken, and a somewhat pearly lustre. The feldspars decompose when exposed to the weather.

The two great subdivisions of the feldspar group are the **MONOCLINIC FELDSPARS** (which include *Orthoclase*, *Adularia*, and *Sanidine*), and the **TRICLINIC FELDSPARS** (among which are *Albite*, *Andesine*, *Anorthite*, *Labradorite*, *Oligoclase*, *Microcline*, and *Bytownite*).

Decomposition of feldspar by carbonated waters is occurring on a large scale over the whole surface of the earth, wherever crystalline rocks are exposed to the action of rain. The potash and soda which are set free are absorbed by the roots of plants.

Uses.—The principal use of feldspar is in the manufacture of pottery, enamel ware, enamel brick and tile, and electric ware. See **KAOLIN**; **PORCELAIN**; **POTTERY**.

Feldspathoids, rock magmas high in alumina, lime, potash, and soda, and low in silica, which tend to crystallize into minerals less acid than the normal feldspars.

Félibres, **les**, a society established in 1854 by a band of poets and enthusiasts for the revival of the old *langue d'oc*, or Provençal language and literature.

Felidae, the cat family, includes the most specialized of the carnivores, especially characterized by the fact that the claws are retractile, that is, are lifted off the ground and enclosed in a sheath of skin on top of the toe, except when drawn forward and down for use. With the exception of the cheeta, or hunting leopard, all its members fall into the very large genus *Felis*, which includes all the cats,

large and small. Consult St. G. Mivart's *The Cat* (1892); E. Ingersoll's *Life of Mammals* (1906). See **CARNIVORA**, **CAT**, **LION**, **LYNX**, etc.

Felix, name of several popes. **FELIX I.** (269-274) was a Roman by birth. He suffered martyrdom under Aurelian.—**FELIX III.** (483-492) was born in Rome. He was involved in the Monophysite controversy, and excommunicated Acacius, patriarch of Constantinople, and thus began the first breach between the Eastern and Western Churches.—**FELIX V.** (1439-49) was Amadeus, Duke of Savoy, who was set up as anti-pope by the Council of Basel in opposition to Eugenius iv., but resigned his dignity in 1449.

Felix, Antonius, a freedman of the Roman emperor Claudius, was procurator of Judæa from about 51 to 62 A.D.

Fell, John (1625-86), English scholar, took up arms on behalf of Charles I. He was created bishop of Oxford (1675). He restored the buildings of his college, and erected the 'Great Tom' tower. He edited the works of St. Cyprian and many editions of the classics. He expelled John Locke from Oxford, but did so very unwillingly. He was the subject of the epigram, 'I do not like thee, Dr. Fell,' etc.

Fellah, plural **Fellahin** (Ar. 'ploughman; peasant; tiller of the soil'), the lowest class of freemen in Egypt, the descendants of the ancient Egyptians, with an admixture of Syrian, Nubian, and Arabian blood, who have mostly become Mohammedans.

Fellenburg, Philip Emmanuel von (1771-1844), Swiss philanthropist and educational reformer, born at Bern. After extensive travels he bought the estate of Hofwyl, near Bern, where he established modern schools (still in existence).

Fellows, Sir Charles (1799-1860), English archæologist, born in Nottingham. He discovered (1827) a new way to the top of Mt. Blanc, which has been generally followed since. His life work, however, lay in Asia Minor, where he traced the course of the Xanthus, and identified many of the very ancient cities.

Fellowship. A university foundation designed for the support of students. The institution arose in the middle ages and originally was nothing more than a charitable foundation to defray the cost of lodging and board for needy students; at a later period generally granted after tests of fitness. In the English universities, where the fellowship system attained its greatest development, the fellows were at first

undergraduates, but gradually came to be chosen from those already holding the university degree. In American universities fellowships are regularly distinctions conferred to enable students to pursue advanced graduate work as distinguished from scholarships or as an honorary distinction. Holders are generally expected to pursue their studies at the institution conferring the fellowship and to perform certain duties. The term fellow is also used of a member of the governing body or trustees of a college, as at Harvard.

Felo de se. See **Suicide**.

Felon. **Paronychia; Whitlow.** A very painful suppurative inflammation at the base of the finger nail, or anywhere in the hand. The inflammation may be superficial, or very deeply seated. In the latter case it may be be-

greenstones. They would now be regarded as trachytes, andesites, and porphyrites.

Felt, a peculiar fabric obtained from woolen and other materials. The individual woolen hairs, unlike cotton or other fibre, are covered with innumerable serrations or teeth, which under the conditions stated become intimately locked together. Felt for carpets, coverings, etc., is manufactured by placing the requisite number of layers of wool that has been carded into laps on top of one another, and passing them in succession between heavy and hollow steam-heated rollers, while they are kept moist by immersion in warm water. In the manufacture of felt hats the fibres employed are chiefly wool, fur, and silk. Among wools, merino or Australian wool is considerably esteemed for this purpose, the 'noils,' or short



Egyptian Fellahin at Work.

neath the dense fascia of the palm of the hand, and the pus may be unable to reach the surface.

Felony. See **Crime and Criminal Law**.

Felsite. Fine-grained, hard, compact, flinty-looking igneous rocks of acid composition have very generally been designated felsites. The microscope shows that many of the felsites consist of a mixture of feldspar and quartz in very minute crystals of irregular form. It seems probable that many felsites were originally glassy obsidians or pitchstones, which in course of time have passed from the vitreous into the cryptocrystalline state.

Felstone, a term formerly employed to designate fine-grained igneous rocks, which as a whole contained little obvious quartz, and at the same time were paler in color and had a lower specific gravity than the basalts and

fibre combings, separated from the longer or worsted fibres of the combing-machine, being largely used.

Felt, Joseph Barlow (1789-1869), American historian, was born in Salem, Mass. He was librarian of the Massachusetts Historical Society from 1842 to 1858, and held other positions in similar associations. His principal works are, *Annals of Salem* (1827); *History of Ipswich, Essex and Hamilton* (1833); *Historical Account of Massachusetts Currency* (1839); *The Customs of New England* (1853); *Ecclesiastical History of New England* (1855-62).

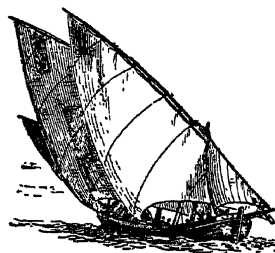
Felton, Cornelius Conway (1807-62), American scholar, was born at West Newbury, Mass., and graduated (1827) at Harvard, at which institution, after several years of service as tutor and professor, he became Eliot pro-

fessor of Greek literature in 1834, and president in 1860. He published a revised edition of Smith's *History of Greece* (1855) with a continuation to modern times by himself.

Felton, John (1595-1628). His failure to gain promotion in the army is said to have led him to assassinate the Duke of Buckingham at Portsmouth, Aug. 23, 1628, for which he was hanged at Tyburn.

Felton, Samuel Morse (1809-1930), Am. engineer, was born in West Newbury, Mass. In 1861 he was informed of a plot to seize Washington just previous to Mr. Lincoln's inauguration, proclaim the Confederacy, and cut off all communication with the north by burning bridges and attacking trains. He organized guards all along the road as repairers, and by delaying the train and cutting the telegraph lines for twelve hours, enabled Mr. Lincoln to reach the capital in safety.

Felucca, the name of the largest and fastest sailing boat of the Mediterranean. It is decked, sits low in the water, and has a high bow and raking stern-post. The rig consists of three masts with lateen sails and a jib.



Felucca.

Feme, or **Femme**, is the Norman-French term used in English law for a woman. 'Baron and feme' means husband and wife, and as the wife is under the protection and influence of the husband during the continuance of the marriage or coverture, she is called a *feme-covert*. An unmarried woman is called a *feme-sole*.

Femoral Artery, the main artery conveying blood to the leg.

Femur. See **Leg**.

Fences. A fence, in an agricultural sense, is a barrier, commonly constructed of stone, rails, planks, pickets, or wire, surrounding or separating areas of land and designed ordinarily to confine stock or prevent their depredations. Fence laws are variable in different regions, but as a rule, in regions where the cultivated to uncultivated or grazing land is large, the laws require owners to fence in their

stock; where the conditions are reversed they often require the owner of cultivated areas to fence out their neighbor's stock. Fencing is more general in the United States than in European countries.

Fencing. When the basket-hilt of the *schiaffona* came into use in Britain, about halfway through the 17th century, the cudgel was sometimes used with such a hilt, as the foil of the backsword; and the word 'single-stick' bears the same relation to the staff, or two-handed stick, as the backsword did to the long two-handed sword. The backsword used by the 'prize-players' from the days of Charles I. onwards marked a very definite period. Samuel Pepys gives a vivid account of the fight between Matthews and Westwicke on June 1, 1663, and of three others in the next six years. The broadsword used by Rob Roy, and described by Sir Walter Scott was a similar weapon. The arrival of Angelo in London, and other sufficient reasons, brought the use of the point into vogue among gentlefolk. The use of the backsword foil was perpetuated in the singlestick, which was the chief attraction at the famous Dover's meetings, or at country gatherings.

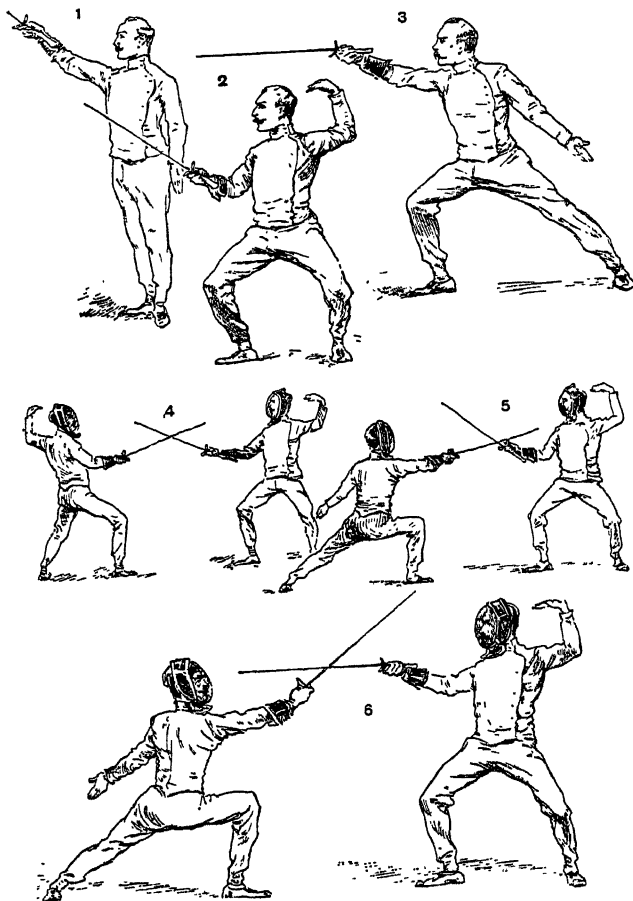
But it is with the use of the point alone that the true fencer is chiefly concerned. The foil he uses is a light four-sided steel blade with a conventional guard to the hilt, and a button on the point. It should be lissom enough to bend easily at a hit, but tough enough to keep fairly straight with good usage. Foil play is almost the only sport in which perfect form means irresistible effectiveness. It exercises the body not in one place only, but in every muscle, nerve, and tendon from heel to head. It does not confine its capabilities for improvement to wrist, or eye, or finger, though these three may be the most important; but it imparts an erect carriage to the head, a bracing action to the shoulders, and a full command of balance and equipoise to limbs and body.

The two great fencing associations in America are the Amateur Fencers' League of America and the Intercollegiate Fencing Association. In the League there is a championship contest each year with foils, duelling swords, and sabres, and it is contested by the winners in the various club tournaments in the large cities of America. The Intercollegiate Association is composed of the large colleges and the naval academy at Annapolis and the military academy at West Point. It also has an annual championship contest with foils only. National champions for 1938 were Darnell Every

(foils); John R. Huffman (sabre); Jose R. de Capriles (epee). A feature of the epee contests was the use of a special plunger on the tip, invented by Alessandrini, which electrically records each point. Helen Mayer was women's national champion with the foils.

mand among the wealthy for fencing instruction.

There are two books in which the development of the art is traced as it deserves: *Schools and Masters of Fence* (new ed. 1892), by Egerton Castle; and *The Sword and the Centuries* (1901) by Alfred Hutton. Con-



Positions in Fencing.

1, First position; 2, Second position, on guard; 3, Third position, the lunge; 4, Engagement in tierce; 5, Parry in quart; 6, Parry in septime.

Fencing has currently become very fashionable. Equipment sales have jumped 50 per cent, and debutantes are taking it up in great numbers to improve their figure and posture. Aldo Nadi of Italy, acknowledged the world's best fencer, came to New York City in 1936 to exploit the growing de-

temporary works are: S. Bertrand, *A Fencer's Companion*, (1935); P. E. Nobbs, *Fencing Tactics* (1936).

Fénelon, François de Salignac de la Mothe (1651-1715), French writer and prelate, was born at the Château de Fénelon in Perigord. In 1678 he was appointed director of the

Nouvelles Catholiques, a community of women recently converted from Protestantism—a post which he held for ten years. During this period he wrote the first of his important works *Traité de l'Éducation des Filles* (1687). In 1689 he was appointed preceptor to the Duke of Burgundy, grandson of Louis XIV., for whose instruction he wrote the *Aventures de Télémaque* (1699), the *Dialogues des Morts*. In *Télémaque* the story is skilfully adapted to illustrate simple political lessons. The versatility of Fénelon's mind reflected the complexity of his character. He is a mystic, a controversialist, a statesman, a literary artist, and a critic. See Duclaux *French Ideal: Pascal, Fénelon and other essays* (New York, 1911).

Fen-ho, the chief river of Shansi, China, joins the Yellow River about Pu-chou-fu. It is only navigable in its lower course, and this is frozen in winter.

Fenianism, a movement of disaffected Irish and Irish-Americans to separate Ireland from Great Britain and form it into an independent republic. The first of the Fenian leaders was James Stephens, later called 'Head Centre Stephens,' one of the revolutionary exiles of 1848, who had taken refuge in Paris, and who, with the support of Irish sympathizers, subsequently organized a conspiracy and endeavored to stir up a rising in Munster. The 'Phoenix Conspiracy,' as it was called, failed; Stephens and some of his associates came to the United States, and found fresh followers among the descendants of those who left Ireland after the great famine of 1847. He and John O'Mahoney organized the movement on this side of the Atlantic. After the close of the Civil War, which cast thousands of adventurous Irishmen adrift, Fenian societies—so named from a Gaelic title—were formed more rapidly in many cities in the United States, and an invasion of Canada, known as the 'Fenian Raid,' was planned and partly carried out in 1866. In the meantime Fenian agitators had been active in Ireland. But the Catholic priesthood denounced the agitation and prevented the mass of the people from supporting it. It collapsed in Ireland in 1867, but in that year several outrages in England forced the British government to give its attention to Irish grievances and to carry out the reforms inaugurated by Mr. Gladstone from 1869 to 1873. Ten years later there was a new development, and Fenian societies in the United States and Ireland were divided into two main bodies, the Clanna-Gael and the United Irish Brotherhood, the former's members in the United States chiefly representing the 'terrorist' element, which sought

to impress, in terms of force culminating in dynamite explosions, the British government with the danger of delay in granting Irish revolutionary demands. They attempted the blowing up of the House of Commons, and committed other outrages in London in 1883. The atrocious murder of Lord Frederick Cavendish and Mr. Thomas Burke, in Phoenix Park, Dublin, in 1882, excited the indignation of the civilized world against the fanatical members of Fenian societies, and was repudiated by the more moderate among them. The I. R. B. or Fenian Brotherhood has been practically extinct since the establishment of the Irish Free State. See O'Leary's *Recollections of Fenians and Fenianism*.

Fenn, Harry (1838-1911), American artist, born at Richmond, Surrey, England. He achieved considerable success as a painter in water-color, and as an illustrator, being one of the founders of the American Water-color Society. He travelled extensively, and the fruits of his travels are to be seen in his drawings *Picturesque America*, *Picturesque Europe*, and *Picturesque Palestine*.

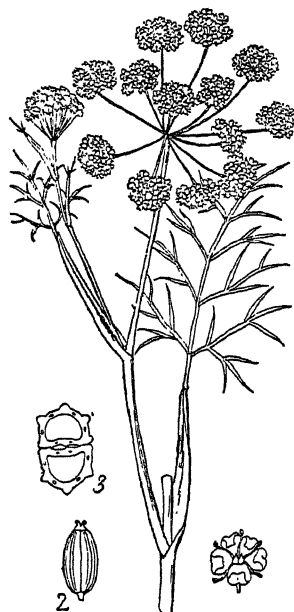
Fennec, a small desert animal found in the arid plains of Africa, and remarkable for its very large ears, which are one of the chief distinctions between the fennec and its allies, the foxes. Like the foxes, the fennec is a nocturnal burrowing animal, and its diet is as varied as that of the former. The pale coloring harmonizes with that of the sands among which the animal lives.

Fennel, a hardy perennial herb belonging to the order Umbelliferae, is a native of Europe. It is characterized by its erect stem, finely divided leaves, and, in late summer by its umbels of small yellow flowers, followed by elliptical fruit. The whole plant has a characteristic flavor and odor, and its leaves are much used in making sauces to accompany fish, and for garnishing. The stems are occasionally boiled and eaten as a vegetable.

Fens, a low-lying region of England, some 70 m. long by 30 m. wide lying around the Wash between Cambridge and Lincoln. It represents a shallow bay or basin, scooped out of the underlying clays by the sea. The Bedford Level was drained in the 17th century, but the final and effective drainage of the Welland and Witham Fens was not accomplished until after the middle of the 18th century (1767-1807). It is computed that between the coming of the Romans into Britain and the present time nearly 70,000 acres have been reclaimed from the sea. The inhabitants of this region have always been noted for their staunch love of

freedom. Boadicea ruled over a part of this country; it was here Hereward held out against William of Normandy; and here Cromwell recruited his formidable Ironsides.

Fenton, Elijah (1683-1730), English poet and translator, was born in Skelton, near Newcastle-under-Lyme, Staffordshire. Pope engaged him to translate four books of the *Odyssey*.



Fennel.

1, Flower; 2, fruit; 3, section of fruit.

Fenugreek, popular name for the leguminous genus *Trigonella*. The fenugreek is cultivated as a fodder plant, and in India is eaten in a green state by the natives. Its bitter, oily seed, of peculiar odor, is employed in the East in curries and bread.

Fenwick, Sir John (c. 1645-97), English soldier and conspirator, took part in two assassination plots against William III. (1695-6), for which he was beheaded.

Feodor I. (1557-98), Tsar of Russia, was the son of Ivan the Terrible, and last prince of the house of Rurik. See **RUSSIA**.

Feodor II., Tsar of Russia, and son of Boris Godounov, succeeded his father when he committed suicide in 1605; but after the people had declared for the false Dimitri (Demetrius), he was deposed, imprisoned, and finally assassinated. See **RUSSIA**.

Fcoffment, originally the only way by

which a freehold estate could be conveyed in England. It still survives, but is little used. It consists in the livery of the seisin—the feoffer expresses on the land (livery in deed), or in sight of it (livery in law), his intention to convey the land to the feoffee. He usually handed him a key or a clod of earth as a symbol of possession; but this is not essential.

F. E. R. A., Federal Emergency Relief Administration. See **UNITED STATES, NEW DEAL**.

Feræ Naturæ, wild animals or birds, which are not the subject of property till they are reduced into possession—by confinement in a park or similar place.

Ferber, Edna (1887-), American writer, was born in Kalamazoo, Mich. She became a reporter on the *Appleton Daily Crescent*, was subsequently employed on the *Chicago Tribune*, and became a contributor of magazine fiction. Her works include *So Big* (1924); *Show Boat* (1926); *Cimarron* (1929); *They Brought Their Women* (1933); *Come and Get It* (1935); *American Beauty* (1937); *A Peculiar Treasure* (1940); *Saratoga Trunk* (1941); and, with George S. Kaufman, the stage successes *The Royal Family*, *Dinner at Eight*, *The Land Is Bright*.

Fer de Lance, an extremely venomous snake of Northern South America, which is closely related to the rattlesnakes, but has no rattle. It sometimes reaches a length of six to seven feet, is reddish brown in color, remarkably fecund, and an object of great dread.

Ferdinand I. (1861-), former king of Bulgaria, was born in Vienna. He was the instigator of the Balkan League which precipitated the Balkan Wars.

Ferdinand I. (1865-1927), king of Roumania, was born in Sigmaringen, Prussia, the nephew of Charles I. of Roumania. In 1914, on the death of his uncle, he became king of Roumania.

Ferdinand I. of Castile (c. 1000-65), a Navarrese prince, second son of Sancho the Great of Navarre. After civil war with Bermudo III. of León, who also claimed the province of Castile, Ferdinand married Bermudo's sister, and was recognized first king of Castile in 1033. At his death Ferdinand divided his states between his three sons, leaving thereby a long heritage of civil war.

Ferdinand III., Saint Ferdinand of Castile and León (1200-52), son of Alfonso IX. of León, by Berenguela (Berengaria), afterward proclaimed queen of Castile (1217). He became king of Castile and León, and these crowns were never afterward separated (1230). One of the greatest of Spanish kings, he initi-

ed the famous codification of the Latin and Gothic laws known as the *Fuero Juzgo*, completed by his son, Alfonso x., the Learned.

Ferdinand V. (1452-1516), king of Spain, was the son of John II. of Aragon. In 1469 he married Isabella of Castile and on the death of her brother Henry IV. (1474) was proclaimed with her sovereign of Castile and Léon. On the death of his father, he succeeded to Aragon (1479), and in 1512 he conquered the main part of Navarre, adding it to his realm. The conquest of the last Moorish kingdom in Spain (Granada) was undertaken (1482-92) with all the fervor of a crusade, and the cruel persecution, spoliation, and expulsion of Jews (1490-92) was equally a matter of policy and a source of revenue. The establishment of the new form of Inquisition by the 'Catholic kings' (1478), and the violation by them of their pledge of toleration to the conquered Moors, were popular in Spain, because they promoted the spiritual pride of orthodox Spaniards. When Columbus appealed to Ferdinand and Isabella for aid in his voyage (1486-92) he found Ferdinand cool, but Isabella pleaded his cause, and Columbus obtained concessions and promises which, however, were never fulfilled. Ferdinand aimed at the formation of a great European coalition and in pursuance of this idea he seized Naples, and outwitted or defrauded most contemporary potentates, including Henry VII. of England. Consult Prescott's *History of the Reign of Ferdinand and Isabella*.

Ferdinand VI. of Spain (1713-59), second son of Philip V., the first of the Bourbon line in Spain. Aided by enlightened ministers, Carvajal and Ensenada, Ferdinand made great and successful efforts to revive art, science, and literature in Spain, and to follow a truly national policy.

Ferdinand VII. of Spain (1784-1833), eldest son of Charles IV. by Maria Luisa of Parma. He repealed the Salic law to enable his daughter (Isabella II.) to succeed him. His brother, Don Carlos, protested, and Ferdinand's death was the signal for the first Carlist War. During Ferdinand's reign Spain lost the greater part of its possessions in North and South America.

Ferdinand I. (1503-64), Holy Roman Emperor, was born in Alcalá de Henares, Spain. He aided Charles in Italy, and on the latter's behalf made the treaties of Passau (1552) and Augsburg (1555). He successfully opposed Charles V's plan of making his son Philip emperor, and was himself elected (1556) to the dignity.

Ferdinand II. (1578-1637), Holy Roman Emperor, was born in Graz. In 1617 he was recognized as heir to the Bohemian throne, and in 1619, on the death of Matthias, was also elected emperor. The Bohemians, however, deposed Ferdinand, and elected Frederick Count Palatine to the Bohemian throne. Out of this grew the Thirty Years' War, in the early stages of which Ferdinand was successful. Hitherto he had relied upon the Catholic League, guided by Maximilian of Bavaria; he now relied upon Wallenstein, who, at the head of a powerful army, endeavored to make the Hapsburgs supreme throughout Germany. Though Christian IV. of Denmark was overthrown in 1626 by Tilly and the army of the League, Wallenstein was, in 1628, checked before Stralsund.

Ferdinand III., Holy Roman emperor (1637-57), was born in 1608 in Graz, the son of Ferdinand II. After Wallenstein's assassination he was made imperial generalissimo, defeated the Swedes at Nördlingen, but continued the Thirty Years' War with France until 1648. On Oct. 24, 1648, the peace of Westphalia was signed. Henceforward the Hapsburgs placed Austrian interests above those of the empire as a whole.

Ferdinand III. (1769-1824), Grand Duke of Tuscany and Archduke of Austria, second son of the Emperor Leopold, in 1790 succeeded his father in Tuscany, and continued his reforming policy. In the reconstitution of Germany in 1803, Ferdinand was named elector of Salzburg, which territory and dignity he exchanged a few years later for the grand-duchy of Würzburg. By the Congress of Vienna (1814-15) Ferdinand was restored to the grand-duchy of Tuscany.

Ferdinand I. (1751-1825), king of the Two Sicilies, a man of weak character, the third son of Charles III. of Spain, was born in Naples. He became king of Sicily (and Naples) in 1759, but was entirely ruled by his high-spirited wife, Marie Caroline of Austria, sister of Marie Antoinette.

Ferdinand II. (1810-59), grandson of Ferdinand I. of the Two Sicilies, began his reign (1830) by granting the Neapolitans a constitution; but under the influence of his second wife, Theresa of Austria, he relapsed into absolutism, thereby provoking incessant revolts, which he suppressed with ruthless cruelty. His nickname of 'Bomba' originated during his bombardment of Messina in 1849.

Ferentino, town, Italy. It has interesting antiquities, and markets wine and oil; p. 13,000.

Fergus Falls, city, Minnesota; p. 10,848.

Ferguson, Hon. George Howard (1870-), Canadian public official, was born at Kemptville. He was minister of lands, forests and mines in the Conservative administration from 1914 to 1919 and after their defeat became leader of the Conservative party in 1920, and premier and minister of education after the triumph of his party at the polls in 1923. His administration was sustained at the general election of Dec. 1, 1926, which was fought largely upon the issue of Government liquor stores versus the previous policy of prohibition.

Ferguson, James (1710-76), Scottish astronomer, was born near Rothiemay, in Banffshire. Among his inventions may be mentioned the *Trajectorium Lunare* (1744), and the *Eclipsareon* (1754). Many of his books on astronomical subjects attained a wide circulation.

Ferguson, Patrick (1744-80), Scottish inventor and soldier, was born in Pitfour, Aberdeenshire. He is mainly known for his invention of a breech-loading rifle (1776), which could be fired seven times in a minute.

Ferguson, Robert (c. 1637-1714), Scotch political writer, called 'the plotter', was born in Badfurrow, Aberdeenshire. He accompanied Monmouth in his descent on the west of England, and was present at Sedgemoor, from which he escaped to Holland (1685). His writings include *History of the Revolution* (1706); *A History of All the Mobs, Tumults and Insurrections in Great Britain* (1715).

Ferguson, Sir Samuel (1810-86), Irish poet and antiquary, was born in Belfast. In 1865 he published *Lays of the Western Gael* in which, and even more in *Congal*, which followed (1872), and in a volume of *Poems* (1880), he showed himself a pioneer of the 'Celtic revival' in literature. *The Forging of the Anchor* (one of the most spirited of the poems of 1880) was republished separately in 1883. He was remarkably successful in reproducing the spirit of ancient Celtic poetry.

Fergusson, James (1808-86), Scotch historian of architecture, was born in Ayr. His fame rests chiefly on three volumes of *A History of Architecture* (1865-7), and a fourth on *The History of Indian and Eastern Architecture* (1876).

Fergusson, Robert (1750-74), Scottish poet, was born in Edinburgh. It was the perusal of Fergusson's poems that revived, at a critical period, Burns' flagging interest in the muse. Many echoes of Fergusson's sentiments and style are to be found in Burns, who also manifests preference for Fergusson's

favorite staves—those of *Habbie Simson* and *Christus Kirk*.

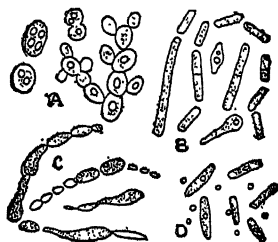
Fergusson, Sir William (1808-77), Scottish surgeon, was born in Prestonpans. He invented many surgical instruments still in use, and wrote the important *System of Practical Surgery* (1842, many editions).

Feriae, the name given to sacred festivals by the ancient Romans. The *feriae* were observed by the performance of prayers and sacrifices; no business at all being allowed while they lasted. There were forty-five fixed festivals every year.

Feringhi, a corruption of *Frank*, the Oriental term for Europeans.

Fermanagh, inland county of Ireland. Agriculture is the principal industry. The county contains ancient castles, raths, and tumuli. There are famous pottery works at Belleek. The chief town is Enniskillen; p. 63,711.

Fermat, Pierre de (1601-65), French mathematician, was born in Beaumont-de-Lomagne, near Montauban, and in early years studied with Pascal. He contributed to geometry a rule which to some extent anticipated the differential calculus; made a notable advance in the theory of numbers which had been stationary for a thousand years; and his correspondence with Pascal, relating to the game of chance, was the germ of the theory of Probability.



Common Ferments.

A, Yeast (*Saccharomyces cerevisiae*); B, *Bacterium butyricum*; C, *Bacterium aceti*, involute form; D, *Bacterium subtilis*, with spores.

Fermentation, in its wider aspect, includes a large number of chemical actions that are brought about either by minute living organisms or by certain unorganized products of animal or vegetable life. Chemically, the changes taking place tend towards the simplification of existing compounds, and are usually either simple decomposition, oxidation, hydrolysis, and a rearrangement of the molecule. The organisms that bring about these changes are low forms of plants of three

kinds—the microbes of bacteria, comprising such forms as bacilli, micrococci, spirilla, etc., which are exceedingly small single cells that usually multiply by division; the yeasts, which are also single but somewhat larger cells, that multiply by budding; and the moulds, which have many cells, branch freely, and multiply chiefly by spores—a method of reproduction that under special circumstances is also followed by the bacteria and yeasts. Besides these organisms, there are some complex nitrogenous compounds obtained from plants and animals which, though dead and unorganized, bring about similar actions. These unorganized ferments, or *enzymes*, may be distinguished from the bacteria, yeasts, etc., by the fact that they cannot be separated from solution by filtration, and though destroyed by heat, stand a higher temperature than the organized ferments. For further information, see Newman's *Bacteria* (2d ed. 1900); J. R. Green's *The Soluble Ferments and Fermentation* (2d ed. 1901); and Lafar's *The Utilization of Microorganisms* (1888-1903).

Fern, any species or plant of the order Filices, which contains the principal part of the vascular cryptogams. Ferns spring from a creeping root-stock, from the lower portion of which roots are sent off, and from the upper portion the leaves arise. The leaf-buds are rolled up in a characteristic manner, like the upper part of a crosier, whence the vernation is said to be circinate; and the leaves grow at the tip till they have attained their full size. The leaves may be simple—that is, undivided—as in the hart's tongue, but are commonly divided, as in the bracken and polypody, which are so well known.

Ferns are widely distributed from temperate to tropical climates, and the number of living forms is probably about three thousand. They are abundant in tropical forests as epiphytes, living on, but not deriving nourishment from trees. One of the finest species is the royal fern (*Osmunda regalis*), which sometimes reaches a height of from eight to ten feet. Fern remains are known from very early geological times; one genus (*Eoptelis*) occurs about the middle of the Silurian period; tree-ferns are met in the Devonian, as well as ordinary ferns closely allied to living forms; they must have been abundant in Carboniferous times, though from this point they dwindle in numbers as higher forms of plant life were gradually evolved (*Pteridospermæ*).

Ferns are largely cultivated in gardens and houses as decorative plants, on account of the graceful character of the foliage. See Eaton,

The Ferns of North America (1880); Bailey's *Cyclopedia of American Horticulture* (1904); Campbell, *The Eusporangiate* (Washington, 1911).

Fernandez, Juan (1538-1602), a Spanish navigator and discoverer of the two islands off the Chilean coast bearing his name (1563). It is reputed that in 1576 he saw a continent which must have been either Australia or New Zealand.

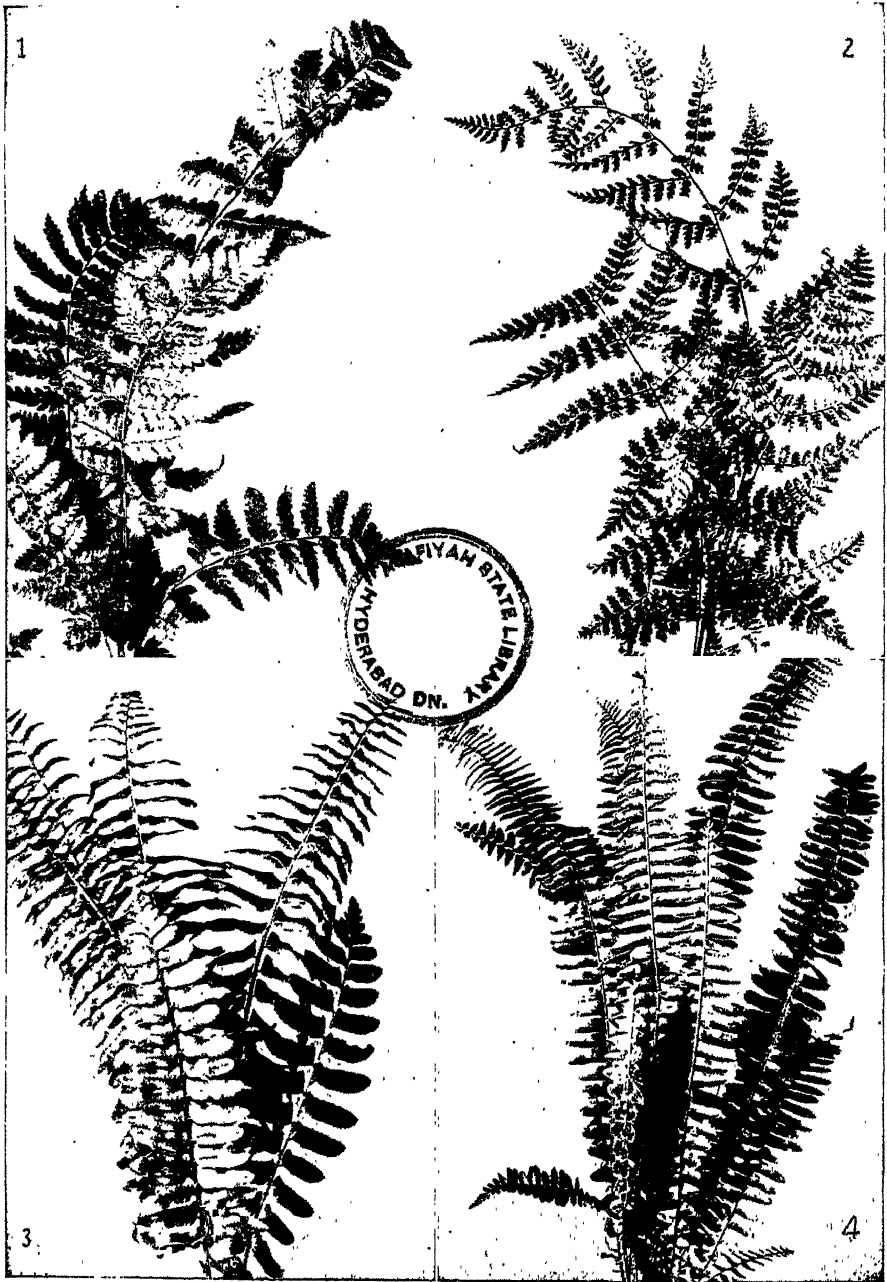
Ferney, or **Ferney-Voltaire**, town, capital of department Ain, France. The Château de Ferney was the home of Voltaire from 1758 to 1778. His name was added to that of the town in 1878.

Fernow, Bernard Edward (1851-1923), American forester, born at Inowracław, Posen, Prussia. He was editor of *The Forester* and editor and publisher of the *Forestry Quarterly*. He published *Economics of Forestry* (1902); *History of Forestry* (1907); *The Care of Trees* (1911).

Ferragus, Ferracut, Ferragut, Fernagu, or **Vernagu**, a giant of early French romance. Nephew of Marsilius, king of Spain, he was sent by him to defy the twelve peers of Charlemagne, whose victorious army had reached the walls of Pamplona. Ferragus overcame eleven, but Roland, the greatest, after several days' combat, killed him with the sword Durandel.

Ferrand, Marie Louis (1753-1808), French soldier in America, baron and count, born in Besançon, France. He joined the expedition of Gen. Leclerc for the subjugation of Haiti in 1802, succeeding Leclerc in command after his death by yellow fever. With an army of 20,000 Dessalines, the leader of the blacks after the treacherous seizure of Toussaint l'Ouverture, besieged Ferrand in the city of Santo Domingo, but was finally driven away, and Ferrand reconquered the Spanish part of the island. In 1804, Napoleon made him captain-general of the island. See *Histoire du Comte Ferrand*, by Denis (1850) and Lacaze (1855).

Ferrara. 1. Province, Italy; p. 271, 26. 2. Fortified city and (since 1735) archiepiscopal see of Italy, capital of above province. As the capital of the powerful family of Este, Ferrara was from the 14th century to the 17th a large and prosperous city. It possesses a fine Lombardesque cathedral (12th and 13th centuries), the castle or old ducal palace, a good picture gallery, a university with about 130 students (founded in 1391), a famous library, and the houses of the poets Ariosto and Guarini. The last-named was born here; also Savonarola; p. 117, 221.



AMERICAN FERNS.

1. Crested Shield Fern (*Dryopteris cristata*). 2. Lady's Fern (*Asplenium filix-fœmma*).
 3. Christmas Fern (*Dryopteris acrostichoides*). 4. Boston Fern (*Nephrolepis exaltata*,
 var. *bostoniensis*).

Ferrari, Gaudenzio (1484-1546), Italian painter. His finest frescoes are on the walls of three of the chapels of the Sacred Mountain of Varallo, and his *Crucifixion Chapel* has been described as 'the most daring among Italian works' of its kind. His *Saint George* and *Saint Anthony of Padua* is owned by the Historical Society of New York.

Ferreira, Antonio (1528-69), Portuguese poet and dramatist, a founder of the classical school of Portuguese poetry, was born at Lisbon. His tragedy *Inez de Castro* (1587; Eng. trans. 1825) was one of the earliest tragedies in Europe after the revival of learning.

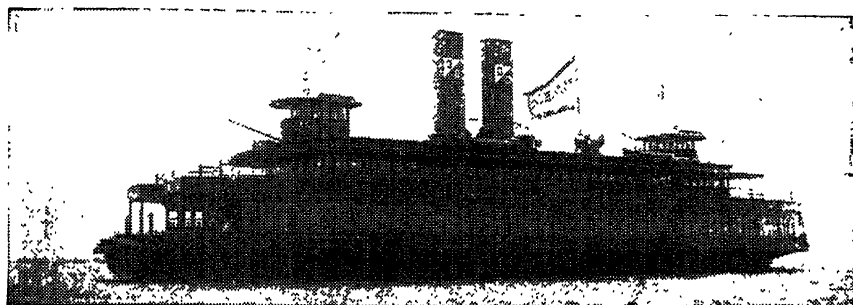
Ferrel, William (1817-91), American meteorologist, was born in Pennsylvania. He invented the maxima and minima tide-predicting machine, which was subsequently used by the government coast survey.

(English edition, 1933, titled *War and Peace*). His books were seized in 1935 by the Italian Fascist Government.

Ferret, a domesticated albinistic variety of the polecat. It is smaller and more slender than the polecat, and is almost always of a yellowish-white color, with pink eyes. Ferrets are bred for rabbit and rat catching, and are ferocious and bloodthirsty creatures, attacking their prey behind the ear, and sucking the blood.

Ferret, black-footed, a small, yellowish black-footed, ferret-like weasel of the plains of the Western United States, where it preys upon prairie-dogs, gophers, birds, and other small animals.

Ferricyanides are the salts of hydrogen ferricyanide, a brown crystalline acid. Its principal salt is potassium ferricyanide, or red prussiate of potash, $K_3Fe(CN)_6$.



A Ferry Boat.

Ferrel's Law, a meteorological generalization propounded by the scientist William Ferrel, that the deflecting force exerted on the winds of the globe by the earth's rotation is inversely proportionate to the velocity of motion, increasing from zero at the equator to a maximum value at either pole.

Ferrer, Francisco (c. 1860-1909), Spanish educator, was born near Barcelona. By means of a fortune left him on the death of a former pupil, he founded the 'Escuela Moderna' (modern school) at Barcelona, with branch schools throughout Spain, in which the anti-state and anti-church teachings were distasteful to the state and church authorities.

Ferrero, Guglielmo (1871-1942), Italian historian. Volume I of his work, *The Greatness and Decline of Rome*, appeared in 1902. He lectured in the United States (1908). Since 1930 he has been professor of Modern History at Geneva U. His works include: *Democracy in Italy*, *La Fin des Aventures*

Ferrier, David (1843-1928), Scottish physician born in Aberdeen. He became professor of forensic medicine at King's College, London, in 1872, which he left in 1889 to take the chair of neuro-pathology created especially for him—an honor to which his brilliant treatise on *Functions of the Brain* (1876) gave him the best of titles. He is also the author of *Cerebral Localization* (1878-90).

Ferris, Albert Warren (1856-1937), American physician, born in Brooklyn. He was editor in charge of the medical department of the *International Year Book*, of the *New International Encyclopedia*, and of *Nelson's Encyclopedia*.

Ferris, Isaac (1798-1873), American clergyman, was born in New York City. He was prominent in Sunday-school work and in foreign missions. Besides many papers, etc., he published *Fifty Years' Ministry in the Reformed Church of America* (1871).

Ferrocyanides are the salts of hydrogen

ferrocyanide, a white crystalline acid. The most important, and the parent substance, is potassium ferrocyanide, or yellow prussiate of potash, a pale yellow solid obtained by fusing nitrogenous animal matter with potassium carbonate and scrap iron, and crystallizing the watery extract of the melt.

Ferry. A franchise or right to maintain a boat upon a river or other body of water and carry people, animals, vehicles, and other property between certain places for a reasonable toll. It is considered to be in the nature of a public highway over the water, and the franchise can only be acquired by legislative authority, either directly, as by a special act, or indirectly, through courts, municipalities, counties, commissioners, or other subordinate bodies, acting under powers conferred by the legislature. The grant by which the franchise is given usually specifies certain conditions as to time, service, etc., and whether the privilege is exclusive within certain limits or not. Either an individual or a corporation may hold this franchise, and preference is given to riparian owners, but it is not connected with ownership of land.

Steam vessels are now employed for carrying passengers and vehicles for short distances across rivers, lakes, and straits. On narrow rivers these ferries are frequently worked by means of a chain lying along the bottom of the river, secured at both ends, and passing over a drum on board the ferry-boat, the drum being revolved by the engine, or in small boats, by hand. The large ferry-boat for passenger traffic is now usually a screw vessel having a screw at either end, it having been found that greater speed and more room could thus be obtained than with paddle wheels. These vessels are found in large numbers in New York Harbor, where thousands of people are transported across the rivers every day.

Ferry, Jules François Camille (1832-93), French statesman, born at Saint Dié (Vosges). Upon becoming (1879) minister of public instruction in the Waddington cabinet, he brought in a bill directed against Jesuit instruction, which eventually accomplished the expulsion of that order from France. He became premier for the first time in 1880, retaining, however, his education portfolio, and annexed Tunis. Again minister of education in 1882, he passed the law making primary education gratuitous and compulsory.

Fersen, Hans Axel von, Count (1755-1810), born in Stockholm. Gustavus III. employed him as a private diplomatic agent, after the revolution. to Louis XVI. and Marie An-

toinette, to whom he was devoted. His plan for the escape of the royal family failed. Under Rochambeau, he had a distinguished part in the American Revolution.

Fertilization, the intimate union of male and female sex elements or gametes—in most cases the indispensable preliminary to the development of a new living creature. It is necessary to distinguish fertilization proper from antecedent steps. 1. There is the process by which the male elements, or spermatozoa, are brought into the vicinity of the ovum. In higher animals this is best termed insemination; it is effected by copulation, and it may lead to impregnation if fertilization in the strict sense occurs. 2. There is the close approach of the spermatozoon to the ovum, under the influence of some vital attraction which is not as yet understood. 3. There is the fertilization process in the strict sense—the intimate union of two gametes. Similarly in regard to the higher plants, although the transference of the pollen grains from stamens to pistils is often spoken of as fertilization, it is only a preliminary to the essential act, and should be called pollination. The term 'amphimixis,' now in frequent use, is a synonym for fertilization in the strict sense. See HEREDITY; HYBRID; MENDEL'S LAW OR MENDELISM; VARIATION; BIOLOGY; CELL; EMBRYOLOGY; REPRODUCTION. Consult E. B. Wilson's *The Cell in Development and Inheritance*.

Fertilizers. A fertilizer, or manure, is in a broad sense any substance which is applied to the soil to increase its productiveness. In a more restricted sense the term manure is commonly applied to animal excreta and similar refuse matter, or so-called natural manures, and the term fertilizer to commercial, or so-called artificial, fertilizing materials. The two terms are, however, used interchangeably.

The necessity for the use of fertilizers arises from two considerations: that certain substances essential to plant growth are derived almost wholly from the soil, and that the amount of these constituents present in the soil in available form is limited, the supply being depleted by the continuous growth of crops, and, to a less degree, by drainage and by fermentation. Fertilizers act either directly, supplying the elements required by the plants, or indirectly, rendering plant food present in the soil more available. The natural manures, as animals' excrement, green manures, seaweed, etc., are both direct and indirect fertilizers; while many of the commercial fertilizers, such as potash salts, nitrate of soda or sulphate of ammonia, and superphos-

phates, are useful mainly on account of their direct action in supplying plant food. A class of fertilizing materials known as soil amendments, or improvers, are valued chiefly for their indirect action. Natural Fertilizers include Barnyard Manure, Green Manure, Seaweed, Guano, Fish Waste, and, to a less degree, Peat, Hair Waste, etc.

Probably the most important and useful of the natural fertilizers is barnyard manure, which not only supplies a certain amount of nitrogen, phosphoric acid, and potash, but is also of great value in improving the general chemical, physical, and biological conditions in the soil.

Ordinary barnyard manure, by which is meant the mixed solid and liquid excrement of various farm animals, combined with litter, and more or less fermented, is naturally very variable in composition. If, however, it has received reasonable care and has not been subjected to excessive leaching and fermentation, such manure may be assumed to be composed of useful materials and water within the following limits:

	<i>Per cent.</i>
Nitrogen.....	.4— .8
Phosphoric acid.....	.2— .5
Potash.....	.4— .8
Water.....	60—75

For practical purposes, therefore, it will be sufficiently accurate to estimate that well-kept manure will contain one-half per cent., or 10 lbs. per ton, of nitrogen and potash, respectively, and one-third per cent., or 6 2-3 lbs. per ton, of phosphoric acid.

A second important class of natural fertilizers, or farm manures, is the green manures, or crops grown to be turned under the soil while they are succulent and will readily decompose. These are of two types: the leguminous plants—clover, cow-peas, soy and velvet beans, vetch, etc.—and a second group including the cereals, grasses, buckwheat, turnips, and rape.

Seaweed has been used for fertilizing purposes from the time of the ancients, but because of the expense of transportation its use in the United States is confined to a narrow strip of coast land. Among the varieties employed are Irish moss, dulse, the rock-weeds, and kelp.

Guano, consisting of the excrement of sea-fowls and other marine animals, mixed with feathers, bones, and the decomposed bodies of the birds, is especially rich in nitrogen and phosphoric acid.

Fish manure, known also as fish guano, is

prepared from fish refuse of various kinds. It is made especially from herrings, sprats, menhaden, and other oily fish after the extraction of the oil for commercial purposes.

The need for the use of commercial fertilizers grows out of the facts that in many cases the supply of natural manures is inadequate to maintain the fertility of the soil, and that such manures are not well adapted to certain forms of specialized intensive farming, as market-gardening, requiring more active plant food than farm manures supply.

The materials used in preparing commercial fertilizers are of three classes: those furnishing nitrogen, such as nitrate of soda, cyanamide, nitrate of lime, sulphate of ammonia, dried blood, tankage, dried fish, cotton-seed meal, etc.; those supplying phosphoric acid, such as bones and bone products, mineral phosphates, phosphatic slags, and superphosphates; and those supplying potash, including especially the potash salts, as muriate and sulphate of potash, kainit, etc.

These are the raw materials from which the various 'brands,' or mixtures, of commercial fertilizers are prepared. A mixture containing materials furnishing all three elements of plant food is termed a complete fertilizer, those furnishing only one or two elements incomplete.

To use fertilizers to the best advantage it is necessary to take into account not only the character of the fertilizers themselves but also the nature of the soil and its previous cropping and manuring, the climatic conditions, and the kind of crops to be grown. As a general rule fertilizers give best returns on soils in good condition, that is, well tilled and abundantly supplied with humus, and on high-value crops, such as market-garden crops, fruits, etc. Crops vary in their fertilizer requirements.

In general farm practice it is advisable to adopt a combined system of rotation of crops and fertilizing which is adapted to local conditions of soil, crop, season, etc., and provide for as complete utilization as possible of farm manurial resources supplemented by commercial fertilizers.

The manufacture and sale of commercial fertilizers are regulated by law in most of the States of the United States. While the laws on the subject vary in many of their provisions, they are very nearly uniform in requiring that brands offered for sale be registered, and that a printed statement be attached to each package, containing such facts as the net weight, guaranteed analysis, minimum percentage of available nitrogen, etc. In 1941 fertilizer consumption in the United States was estimated

at 9,264,515 tons. See Voorhees, *Fertilizers* (1926); Bear, *Soils and Fertilizers*, 3d ed. (1942).

Fescennine verses were one of the earliest kinds of Italian poetry; they were usually dialogues of extempore verse, bandied about among the rustics at festivals, and were of a broad and licentious humor.

Fessenden, Thomas Green (1771-1837), American writer. He contributed several humorous poems to Joseph Dennie's *Walpole Farmer's Museum*, including his most popular piece, 'The Country Lovers,' which Mr. Lowell idealized in 'The Courtin'.' He founded the *New England Farmer* at Boston, and was associated with this paper until his death. He published *Democracy Unveiled* (1806); *The American Kitchen Gardener*.

Fessenden, William Pitt (1806-69), American statesman and financier. In the Senate he was a leader of those who vigorously fought all extension of, and any concession to, slavery, to which institution he had from boyhood been opposed; and immediately after beginning his service he attracted national attention by a speech against the Kansas-Nebraska Bill. During the Civil War he ably supported the administration of President Lincoln, and as chairman of the Senate Committee on Finance rendered services of the greatest value to the national government. In July, 1864, he became Secretary of the Treasury, and served until the close of Lincoln's first term. His position was one of peculiar difficulty, but he discharged his duties with rare judgment and ability, and, through Jay Cooke, was able to place a popular loan of \$718,000,000, in the form of notes and payable in three years. Besides being again the chairman of the Committee on Finance, he was chairman, also, of the Joint Committee on Reconstruction.

Festoon, in architecture, a decoration resembling a wreath of flowers suspended between two points. In classic architecture, a sculptural representation of flowers and foliage ornamenting the frieze and pediment.

Festus, Porcius, succeeded Antonius Felix as procurator of Judæa in 62 A.D., and repressed with severity the malefactors who infested the province. He admitted the innocence of St. Paul when the apostle defended himself before him in that year.

Fetiales, certain Roman priests, whose business it was to watch over Rome's relations with her neighbors.

Fetishism, or **Fetichism**, denotes the primitive religious condition in which objects are venerated because of their oddity and

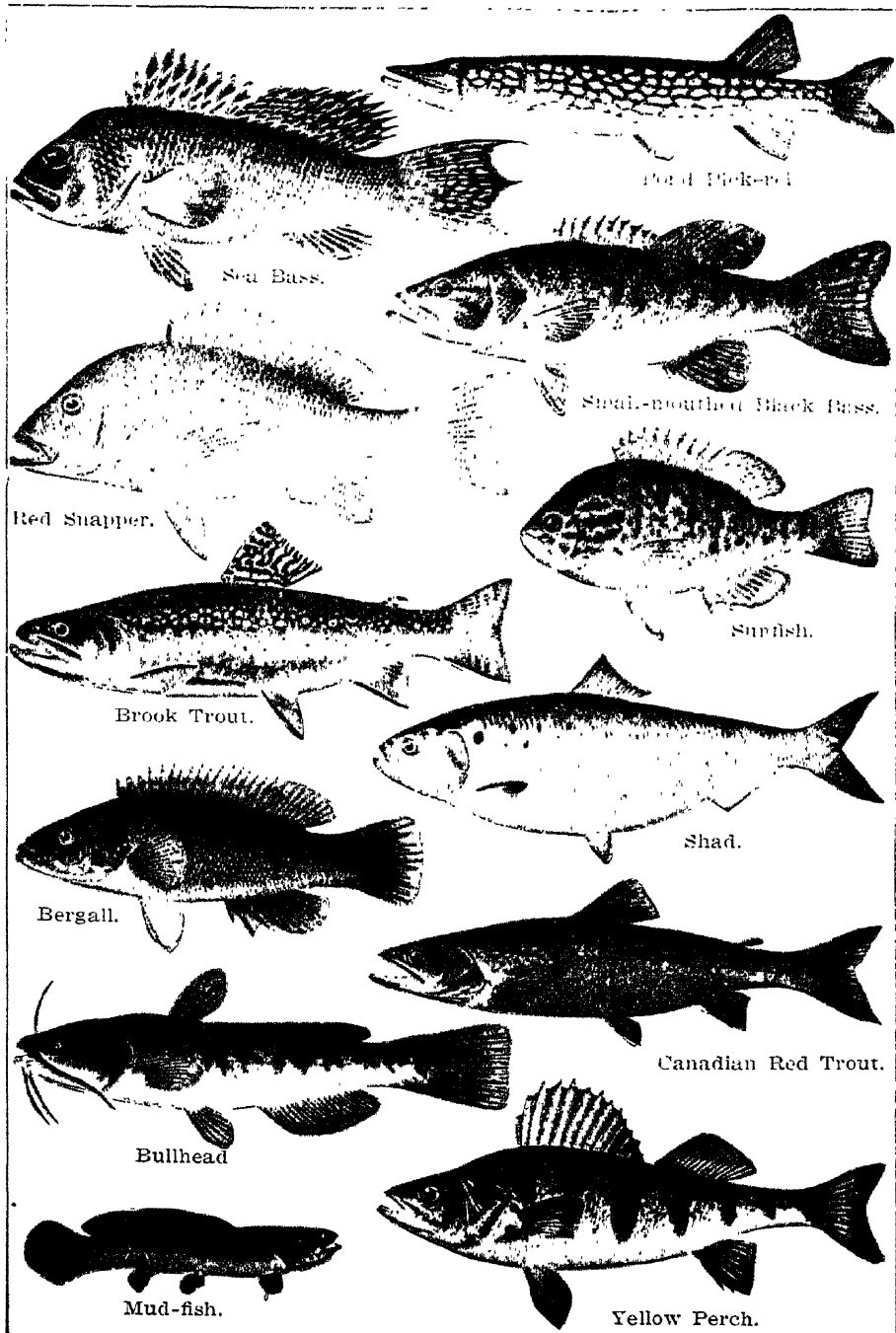
their consequent supposed relationship to some particular desired end. The fetish is not a universal power; its applicability and domain is limited. The term is applicable to the state of mind which recognizes inherent virtues in charms, amulets, 'lucky' coins and the bones of saints. Consult Frazer's *Golden Bough* (1900), Nassau's *Fetichism in West Africa* (1904), Milligan's *The Fetish Folk of West Africa* (1912).

Feu and Feu-duty. In Scotch law, a feu is in effect a sale of land in consideration of rent in perpetuity instead of a capital sum of money.

Feuchtwanger, Dr. Lion (1884-), German novelist, satirized America in his *Pep*; *American Song Book* (1928) several years before he visited the United States. His *Jew Suss* had a large circulation when translated into English. Other books: *Warren Hastings*; *Vasantasena*; *The Prisoners of War*; *Thomas Wendt*; *The Ugly Duchess*; *The Oil Islands*; *Success*; *Josephus*; *Power*; *The Devil in France* (1941); *Double, Double Toil and Trouble* (1943). After Feuchtwanger criticized Hitler's *My Struggle* while in the U. S. in 1933, his Berlin home was raided.

Feud, a contest by one family or tribe against another to avenge loss of life or other injury done to any of its members. It was practised in Europe during the middle ages. It still exists in certain places where public justice is unable to inflict adequate penalties for crime. The most notable examples in Europe are the vendetta in Corsica, Sicily, and Calabria in Southern Italy, and among the Albanians of Montenegro. It is also known in certain parts of eastern Kentucky, especially Clay county, and in West Virginia and the mountains of Tennessee.

Feudalism. Feudalism came into existence after the collapse of the empire of Charlemagne, and dominated the history of Europe for five centuries. The relations of feudalism were established in two ways—by the beneficium, or by commendation. By the first the king granted a tract of land to a retainer, or to some relative, on condition that he rendered military service when required. The beneficiary, in turn, allotted part of his grant to his retainers on the same condition of personal service, but the service was to himself, not to the king; and few monarchs were strong enough or wise enough to emulate William the Conqueror, who, at Salisbury, in 1086, made all holders of land swear direct fealty to himself, whatever might be their relation to some intermediate lord. By commendation the weaker



NORTH AMERICAN FOOD AND GAME FISHES

submitted himself to a superior, swearing fealty to him, and holding his lands thenceforth on a military tenure.

Feudalism is seen at its best in England, at its worst in Scotland. The decay of feudalism, which the growing power of the central authority rendered inevitable, was promoted largely by economic causes. One of the most important was the beginning of the emancipation of English labor; for labor rents, which were the badge of servitude for the large class of villeins, were freely commuted into money payments. The introduction of money payments also made both bequest and inheritance easier. The instinct of the noble families tried to counteract this influence by a system of entails to check bequests; but nevertheless land came to be more of a commodity, and alienation a distinct possibility as well as a prospective gain. See Stubbs's *Constitutional History* (1866); Jenks's *Law and Politics in the Middle Ages* (1898); Bateson's *Medieval England*; Davis's *Life on a Medieval Barony* (1923).

Feu de joie is a discharge of firearms practised in the British army by way of public rejoicing or salute.

Feuerbach, Anselm von (1829-80), German painter, the representative of modern classicism. His first important picture, *Hafis at the Well*, was painted in Paris in 1852, his *Death of Pietro Aretino* at Carlsruhe in 1853, while other important works are his subjects from Dante (1857-61); also his *Iphigenia in Tauris*, and a solemn, tragic *Pieta* (1862). At Vienna he painted the powerful ceiling design, *The Titans*, in the Museum of Modelling.

Feuerbach, Ludwig Andreas (1804-72), German philosopher, born at Landshut, studied under Hegel. Several works on the history of philosophy led up to *Das Wesen des Christenthums* (1841), translated into English by George Eliot, an attempt to reduce God, the future life, and holiness into terms of the extravagant desires of a fugitive race upon an inconsiderable planet. This was followed by several works antagonistic to religious belief, and developing a hedonistic ethical theory. 'Der Mensch,' said Feuerbach, 'ist nur was er isst' ('Man is only what he eats').

Feuerbach, Paul Johann Anselm von (1775-1833), German jurist, and father of the above, was born at Jena. Among his works, which exercised a profound influence on German criminal law, are *Kritik des naturrechtlichen Rechts* (1796); *Merkwürdige Kriminalrechtsfälle* (1808-11), a work of great psychological in-

sight; and *Kleine Schriften vermischten Inhalts* (1833).

Feuillet, Octave (1821-90), French novelist and playwright, is remembered for several witty and pleasant works of fiction, including *Le Roman d'un jeune Homme pauvre* (1858), which also succeeded on the stage. Feuillet served his apprenticeship as literary assistant to Dumas, and was elected to the Academy in 1863.

Feuilleton, 'the bottom part of newspapers, generally devoted to light literature or criticism,' is a feature peculiar to the French newspaper press, though it has been adopted to some extent in Germany, and, in a still smaller degree, in England and the United States.

Féval, Paul (1817-87), French novelist. He is best remembered for his sensational *Mystères de Londres* (1844).

Fever. The temperature is to some extent an index to the severity and danger of a febrile attack, but the strength of the various organs, more especially the heart, stomach, and brain, must also be taken into account, while certain fevers have special dangers peculiar to themselves. Thus in typhoid fever intestinal lesions, and in acute rheumatism cardiac lesions, constitute dangers quite apart from high temperature. From 103° to 105° is a highly febrile temperature, while over 105° is hyperpyretic.

The causes of the febrile state are numerous. They may be grouped thus: Specific fevers, such as scarlatina, measles, smallpox, pneumonia, and typhoid; constitutional conditions, such as chorea and rheumatism; inflammatory affections, such as abscess, pleurisy, and bronchitis.

Feverfew is a name given to various composite flowering plants, principally to *Chrysanthemum parthenium*. This is a perennial plant with evergreen, deeply-cut leaves which have a characteristic powerful perfume. In early autumn it bears numerous small white and yellow flower-heads.

Feverwort, or **Horse Gentian**, is a name given to certain hardy perennial plants belonging to the genus *Triosteum*. Its berries, when dried and roasted, have been used instead of coffee, and its root is an emetic and cathartic drug.

Fevillea is a genus of tropical climbing shrubs belonging to the order Cucurbitaceæ. *F. Moorei* is the one most usually grown. This is a slender, evergreen climber of considerable vigor, with long, thin, ovate leaves and pale-reddish flowers.

Fewkes, Jesse Walter (1850-1930), Am. ethnologist. He conducted the Smithsonian

Archæological expedition to Arizona. One of his most notable publications is a pamphlet on the ceremonies of the Moqui Indians.

Fez (Turkish), a brimless head covering of wool, cloth, or felt; a skull-cap, in the form of a truncated cone, ornamented with a long black tassel: the national head-dress of the Turks, generally of a dull crimson color. The name is said to be derived from Fez in Morocco, where the caps used to be manufactured.

Fez, city, Morocco, is a holy city, the chief commercial center, and one of the capitals of the sultan. Old Fez contains the mosques, bazaars, and caravanserais, and New Fez is the official district, containing the palace, and the 'Mellah' or Jews' quarter. The most beautiful of the one hundred and thirty mosques is that of Bu Ainan; to the largest, which is also the largest in Africa, the Kairuin, is attached the Kairuin University. In the 13th century Fez was the capital of an independent kingdom; three centuries later it was conquered and annexed by Morocco; p. 125,000.

Fezzan (anc. *Phazania*), country s. of Tripoli, North Africa. It was anciently the country of the Garamantes, conquered by the Roman Balbus in 19 B.C.; p. 75,000.

F. H. A., Federal Housing Administration. A U. S. New Deal agency.

F. H. L. B. S., Federal Home Loan Bank System. A U. S. New Deal agency.

Fiala, Anthony (1869-), American Arctic explorer, was born in Jersey City, N. J. In 1903-05 he commanded the Ziegler Polar Expedition, which made three attempts to reach the pole—two in 1904 and one in 1905. The expedition failed to better the earlier record of Abruzzi, but succeeded in surveying the Franz Joseph archipelago and discovered three large islands and several channels and headlands. His published works include *Troop C in Service* (1899), and *Fighting the Polar Ice* (1906).

Fiber, a stringy, thread-like structure occurring in the mineral, vegetable, and animal kingdom. Of the first, asbestos and amianthus are examples; hemp, flax, cotton, coir, and jute are among the most notable types of the second; and the fibers from the cocoon of the silkworm, the hair of goats, camels, and horses, and the wool of sheep of the third.

Fibrin, an albuminate or proteid which occurs in muscle tissue, blood, and certain vegetable products. In blood it exists only in small quantity, 0.1 to 0.4 per cent.; but in the presence of a ferment, fibrin enzyme, which is given off by the corpuscular elements of the blood, fibrin passes from a soluble into a co-

agulated state, forming a spongy network in which the corpuscles lie entangled. Chemically it contains about 15 per cent. of nitrogen, the other elements being carbon, oxygen, and sulphur. Like other albuminates, it has a high food value.

Fibula, the bone popularly called the small bone of the leg, which supports or holds together the soft parts on the outer side of the leg below the knee.

Fichte, Immanuel Hermann von (1797-1879), German philosopher, son of Johann Gottlieb Fichte, was born in Jena. His philosophical system was eclectic, and was directed chiefly toward an orthodox 'concrete theism.' His published works include *Beiträge zur Charakteristik der neuen Philosophie*.

Fichte, Johann Gottlieb (1762-1814), one of the greatest of German philosophers. Following his appointment (1793) to the chair of philosophy at Jena, Fichte published three important works—*Wissenschaftslehre* 'Doctrine of Knowledge,' 1794, *Grundlage des Naturrechts* 'Foundations of Natural Right,' 1796, and *System der Sittenlehre* 'System of Ethics,' 1798—in which he developed his early metaphysical doctrine as an advance on the critical philosophy of Kant. A charge of atheism led to his dismissal from Jena, and he went to Berlin (1799), where he lectured without official position, coming under the influence of Schlegel and Schleiermacher. There he published his *Ueber die Bestimmung des Menschen* ('Of Man's Vocation,' 1800), in which his thought enters its later stage—that of the reconciliation of religious with first principles. He was appointed to the chair of philosophy at Erlangen in 1805, but continued, as before, his winter courses of lectures in Berlin.

Fichte's most mature work dates from this period. The treatises 'Of the Nature of the Scholar' (1805), 'Characteristics of the Present Epoch' (1806), and the 'Way to the Blessed Life, or Doctrine of Religion' (1806), are marked by high spiritual insight and fervor. Napoleon's victories in Germany roused to the utmost the philosopher's patriotism, and in his *Reden an die deutsche Nation* ('Addresses to the German Nation') he called upon his fellow-countrymen to establish German freedom upon the highest moral basis, and especially upon genuine educational reform. In 1810 he was elected rector of the University of Berlin, a post he occupied until his death in 1814.

See KANT; HEGEL. Consult Adamson's *Fichte*, Everett's *Fichte's Science of Knowledge: a Critical Exposition*, Kuno Fischer's *J. G.*

Fichte und seine Vorgänger, and Färber's *J. G. Fichte*.

Fichtelgebirge, mountainous region in Northeastern Bavaria. It is famous for its picturesque scenery, and granite quarries afford an important industry.

Fick, August (1833-1916). German philologist, was born in Petershagen near Minden. His chief works are *Vergleichendes Wörterbuch der Indogermanischen Sprachen* (4th ed. 1890-4); *Die griechischen Personennamen* (1874).

Fiction, Legal. See **Common Forms; Pleading.**

Ficus, a genus of ornamental trees and shrubs belonging to the order Moraceæ. The Common Fig is the species of chief economic importance. Other widely known species are the East India Rubber and the Banyan Tree.

Fideicommissum, in Roman law, a trust for carrying out the wishes of deceased persons.

Fidenæ, ancient Italian town in Sabine territory. It was frequently at war with Rome, but was taken and destroyed in 438 B.C., though it was afterwards rebuilt. Scarcely any traces of the city now remain; the site is occupied by the Villa Spada.

Fides, a goddess of ancient Rome, the personification of faith, honor, and uprightness.

Fief, a term meaning primarily cattle, and secondarily goods, but which has come to be used in a technical sense, in connection with feudalism, for the sum total of privileges conferred on a vassal or dependent.

Field, Magnetic. See **Magnetism.**

Field, Cyrus West (1810-92), American merchant and promoter. Conceiving the idea of a cable from Newfoundland to Ireland, Field busied himself with its promotion, and obtained a charter, in 1854. Three years later, the first effort was made to lay a cable from the Irish coast at Valentia. This was a failure, through the parting of the cable, but the following year (1858), a cable was laid, and a message from Queen Victoria to President Buchanan was conveyed on Aug. 16, 1858. Field was highly acclaimed, but on Sept. 1 the cable suddenly ceased working, and its promoter was forced into bankruptcy.

On July 27, 1866, a new cable was successfully landed on the Newfoundland shore, by the steamship *Great Eastern*, Field's efforts were at last crowned with success; and honors were showered upon him. He subsequently engaged in railroad operations and was one of the projectors of the elevated railroad in New York City. See **ATLANTIC CABLE**. Consult *Life*, by his daughter, Isabella Judson Field.

Field, David Dudley (1805-94), distin-

guished American jurist. He early saw the need of reform in both civil and criminal procedure in New York, and attracted general attention by the publication of a *Letter on the Reform of the Judiciary System* (1839), and of a pamphlet, *The Reorganization of the Judiciary* (1845). As a commissioner appointed by the New York legislature he prepared Codes of Civil and Criminal Procedure, which were adopted in that State (1848-50), and subsequently in other States, and are of great significance and importance in the history of judicial procedure in the United States. In 1857 he became the head of another commission appointed to prepare a new and complete penal, civil, and political code for New York, and did this work (completed in 1865) with thoroughness and efficiency.

An ardent advocate of arbitration, D. D. Field prepared *Draft Outlines of an International Code* (1873), which gave him a European reputation. In 1890 he presided over the Peace Congress in London. Consult his *Speeches, Arguments, and Miscellaneous Papers* (3 vols., 1884-90), and the *Life* by Henry M. Field.

Field, Eugene (1850-95), American author and journalist. Field drifted about from one newspaper to another in Missouri and Kansas, until he was called to the Chicago *Daily News* (afterward the *News Record*) in 1883 from the Denver *Tribune*, where he had acquired a reputation as a humorist. He satirized the crudities of Western life, and was the enemy of sham wherever he discovered it, at the same time writing some of the most delicate and fanciful poems about children in the English language. His first publication was *The Denver Tribune Primer* (1882). His writings include *Culture's Garland*; *A Little Book of Western Verse* (1889); *A Little Book of Profitable Tales* (1889); *Echoes from the Sabine Farm* (with Roswell M. Field, 1893), *The Holy Cross, and Other Tales* (1893), and *Love Songs of Childhood* (1894).

Field, Henry Martyn (1822-1907), American clergyman and author, born at Stockbridge, Mass. He bought an interest in the New York *Evangelist*, of which he afterward became editor and proprietor. During his editorship he made many trips to foreign parts, setting down his experiences in several books of travel, including *From Egypt to Japan* (1878), *On the Desert* (1883), and *Among the Holy Hills* (1884). He also prepared lives of his brothers, David Dudley and Cyrus W. Field.

Field, John (1782-1837), British composer, was born in Dublin. Much praised as a pianist

by Spohr and others, he is remembered especially for his 'nocturnes,' full of romantic charm, which greatly influenced Chopin.

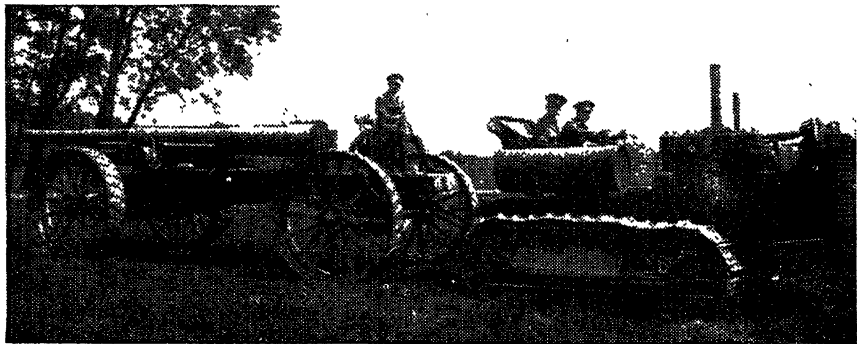
Field, Marshall (1835-1906), American merchant, born in Conway, Mass. In 1865 he organized the firm which subsequently became Marshall Field & Co. Under his management it became one of the three leading mercantile houses in the world. It is estimated that his fortune, apart from his real estate holdings in Chicago and elsewhere, amounted to \$150,000,000. He was noted for his generous benefactions to the University of Chicago, and for his support of the Field Columbian Museum at Chicago.

Field, Stephen Johnson (1816-99), eminent American jurist, brother of David Dudley, Cyrus West, and Henry M. Field. As a member of the first State legislature of California (1850) he did much to bring about the

The European War witnessed a use of artillery of all calibers unparalleled in history; and the special conditions of trench warfare on the Western front in France and Belgium have brought about many temporary modifications in the methods of handling field artillery.

Mechanical traction has increased the mobility of the heavy siege guns, but the tractors and heavy guns require roads, the guns cannot go into action quickly, and their rate of fire is slow. Therefore such guns, even though able to keep up with the troops on the march on good roads, lack the essential qualifications of the field guns, of being able to follow the infantry wherever it goes, and of opening a rapid fire on short notice.

Field artillery is classified into Mountain, Light, Horse, and Heavy Field Artillery. All three types accompany the troops, and are



Field Artillery.

establishment of an efficient State judiciary system, the criminal and civil procedure of the courts being adopted after that drawn up for New York by his brother David Dudley. He was also the author of an important law providing for a system of mining regulations based closely on the customs and usages of the miners themselves in settling controversies.

In 1863 President Lincoln appointed S. J. Field to the U. S. Supreme Court. As a member of the commission appointed for the purpose (1873), he helped revise the code of laws of California.

Field Artillery is that part of the artillery of an army which accompanies the troops, and forms a part of mobile tactical units, as distinguished from the heavier calibers, which are either immobile or can move only over good roads or railroads, and which, in consequence, are kept at some distance in rear of the columns when on the march.

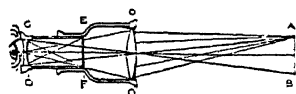
ready to support the infantry and go into action on short notice.

Field Cooking, or the preparation of army rations in the field, in the U. S. Army is in the immediate charge of the mess sergeant, who, under the direction of the company commander, draws or purchases all rations and other supplies for the mess, prepares the bills of fare, and is responsible for the care of rations and kitchen equipment and for conduct at meals.

Field Equipment, Military. This equipment includes all articles issued by the quartermaster, ordnance, and other departments, to the soldier or officer for his personal use, when on active duty in mobilization, concentration, instruction, or manœuvre camps, as well as on campaign, simulated campaign, or the march. Such articles include his rifle, bayonet, gun sling, revolver, cartridge belt, and saber or sword; the articles pertaining to personal

comfort, as the half of a shelter tent, canteen, haversack for carrying rations, first-aid pouch, clothing bag for extra clothing, and toilet roll for carrying tooth brush, hair brush and comb, towel, and the few small articles that the soldier wishes to have about him. The articles carried vary somewhat according to the branch of service, though all are of the same general pattern. See KIT.

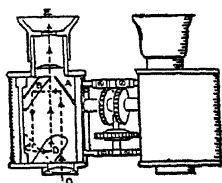
Fieldfare, a species of thrush, common in Great Britain as a winter visitor. It is a native of Northern Europe, but migrates south in winter as far as the Mediterranean.



Galilean or Ordinary Field Glass.

AB, object; oo, object lens; cd, eye piece (concave); EF, virtual image.

Field Glass, an optical instrument for viewing distant objects, composed essentially of two telescopes reduced in size. Field glasses are of two kinds—the Galilean type, and the prismatic combination. The latter comprises binoculars in the form of double-eyed telescopes, monoculars or single-eyed pieces, and the special binoculars used by field naturalists.



Prismatic Field Glass.

The rays from the object, o, are reflected by the prism at A and B, and again at C and D to the eye at E.

The prismatic binoculars of today are made in four different powers, the one magnifying three diameters now taking the place of the opera glass for the theater; the glasses magnifying six and nine diameters taking the place of the Galilean type for general use; while binoculars with a power of twelve diameters, but not taking in such a large field of view, are of special service to the naturalist and the military and naval officer. See TELESCOPE; MICROSCOPE.

Field Hospital, an army hospital including tents, stretchers, and other equipment, capable of being transported from place to place in the zone of military operations.

Fielding, Henry (1707-54), English novelist, born at Sharpham Park, near Glastonbury, Somersetshire. *The History of Tom Jones*, published in 1749, is Fielding's most celebrated novel. To a more careful workmanship is added a riper experience, both of life and literature, than appears in his earlier work. *Amelia* (1751). Fielding's last novel, is somewhat less powerful than *Tom Jones*.

Fielding rebelled against the cramped, conventional morality of Richardson, which spelt mere virtuous respectability, and drew a broader, more human picture of life. His style is as vigorous as his thought, while his humor never fails, even when, as in writing *Jonathan Wild*, he was in the midst of family and financial troubles. The first collected edition of his works was published in 1762; another edition in 10 vols. by W. E. Henley appeared in 1904.

Fielding, William Stevens (1848-1929), Canadian public official, was born in Halifax, N. S. He was a representative at the Conference of Colonial Premiers in London in 1902; delegate to the Imperial Conference in 1907; and one of the plenipotentiaries who negotiated the Franco-Canadian commercial treaties of 1907. He also negotiated commercial arrangements with the United States, Italy, and Belgium (1909-10), and with Japan (1911).

Field Madder, a naturalized weed with pointed leaves arranged in whorls, and little umbels of tiny pinkish flowers.

Field-marshal, the highest rank in the British army; promotion is made from the list of general officers, and entirely by royal selection.

Field Museum of Natural History, founded by and named after Marshall Field, a Chicago merchant. It is situated in Chicago, and is divided into four departments: anthropology, botany, geology, and zoology. It has a working library of about 50,000 titles, an exchange system, departmental laboratories, an herbarium, and study collections of many thousand specimens.

Field Officer. A military term applied to all officers above the rank of captain and below that of general. The division is this: *line* officers are all up to and including the grade of captain; *field* officers, to include the grade of colonel, and *general* officers all above the grade of colonel.

Field of the Cloth of Gold, the name given to the meeting between Henry VIII. and Francis I. of France, in June, 1529, near Calais, so called because of the magnificence and splendor of the proceedings; the negotiations led to a treaty between Henry and Francis.

Fields, James Thomas (1817-81), American publisher, author, and lecturer. He was a partner in the firm of Ticknor & Fields, which included on its list of authors, Emerson, Hawthorne, Longfellow, Whittier, Holmes, and many others. In 1861 Mr. Fields succeeded Lowell as editor of *The Atlantic Monthly*.

Fields, W. C. (Claude William Dukenfield) (1879-), American stage and motion picture comedian. Beginning as a juggler in vaudeville, he became one of the most popular of film comedians.

Field-works. See **Fortification**.

Fieri Facias. Under the common law practice, a writ directed to the sheriff, commanding him to seize sufficient of the goods of a judgment debtor to satisfy the judgment.

Fiesole, town and episcopal see of Italy, province Florence, has ancient Etruscan and Roman remains, an 11th-century cathedral, and some fine late mediæval monasteries, in one of which Fra Angelico lived for some time. The people are engaged in straw-plaiting; p. about 2,000.

Fife, a musical instrument belonging to the flute family, and seldom having more than one key. The compass of the fife is about two octaves, and as the scale is diatonic, only airs of simple melodic structure can be played upon the instrument.

Fife, chief station of the African Lakes Corporation, on the Stevenson Road, British Central Africa.

Fifeshire, a maritime county of East Scotland, bounded on the n. by the Firth of Tay, s. by the Firth of Forth. Area, 504 sq. m.; p. 202,000. The minerals include coal, iron-stone, limestone, freestone, and shale. For centuries Fife has taken a leading place in the development of agriculture; manufactures include linen at Dunfermline and floorcloth. St. Andrews is the 'Mecca' of golf, and almost every coast town has its links. The antiquities include remains of Roman military stations; monastic buildings at St. Andrews; Falkland Palace and St. Andrews Castle.

Fifth-Monarchy Men, a religious sect, whose distinguishing tenet was a belief in the coming of a fifth universal monarchy, of which Jesus Christ was to be the head. They ap-

peared in England towards the close of the Protectorate.

Fig, any tree or shrub of the genus *Ficus*, the most important of the Moraceæ, widely distributed in warm countries. Many have edible fruit, but by far the most important is that of the common fig, a tree introduced into Europe from the East in early times. It is cultivated in California and occasionally in the



Fig.

1, Female flower; 2, male flower; 3, sec. of fig.

eastern United States, particularly in the Carolinas. Green figs are esteemed as dessert fruit; and large quantities of dried figs are exported from the Mediterranean districts, those from Smyrna being considered the best.

Figaro, a comic character introduced upon the stage by Beaumarchais in 1775, and appearing in the *Mariage de Figaro*, *Barbier de Séville*, and *Mère Coupable*.

Figaro, Le, one of the most widely circulated of all French newspapers; has been published more or less intermittently since the early part of the 18th century. Twice a week a literary supplement is issued, and an *Illustrated Figaro* is published every month.

Fighting-fish, a name given to a bony fish of the family Labyrinthidæ, found in the streams of Siam.

Fig-shells, are tropical gasteropods with elongated pear-shaped shells, with a short spire and a long canal. A species is common along the north-eastern shore of the United States, where it is known as conch or winkle, and is very destructive to oysters.

Figuier, Guillaume Louis (1819-94), a popular French scientific writer, born at Montpellier, was editor of *L'Année Scientifique et Industrielle*, 1856. Some of his works have ap-

peared in English translations, as *The Ocean World*, *The World before the Deluge*, *The Day after Death*, and others.

Figurate Numbers, in mathematics a series of numbers which may or do represent some geometrical figure, in relation to which they are always considered as triangular, pyramidal, hexagonal, etc., numbers.

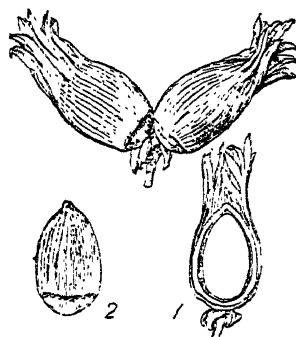
Figurehead, Ship's, a bust or full-length figure placed over the cut-water of a ship immediately under the bowsprit. Great expense was formerly lavished on their decoration; a master carver superintended the embellishment of stern and prow. A number of the older frigates in the U. S. navy had handsomely carved figureheads in which the name of the vessel suggested some allegorical treatment.

Figwort, a name given to various members of the genus *Scrophularia*, the characteristic features of which are a five-lobed calyx, a nearly globose corolla, the upper lip of which is two-lobed and the lower three-lobed, and a capsule opening with two valves, the edges of which are turned in.

Fiji, a group of islands in the Pacific, from 200 to 250 in all, about 1,900 m. n.e. of Sydney, Australia; total area, including Rotuma, 7,435 sq. m. About eighty of the islands are inhabited. On the windward or s.e. side, the islands are clothed with dense forest and jungle; on the lee side is grass land, more lightly timbered. The climate is cool for the tropics; there is rain all the year; the driest period is from April to October. There are millions of cocoanut palms; sugar, copra, bananas, pineapples, colonial distilled spirits, turtle-shell, bêche-de-mer, etc., are exported. Dark and frizzly-haired, the Fijians are Melanesians, with a Polynesian strain in the east. Fiji is British, and is administered by a governor appointed by the crown, assisted by a legislative council; p. 205,379. In 1942 U.S. armed forces were based on Fiji, having taken over the defence of the islands from New Zealand troops.

Filariasis, a parasite found in the blood, lymph, and other fluids of the human body. The filaria whose life history is best understood at present, is *Filaria Bancrofti*, a slender, spiral, snakelike form, infesting human lymphatics in tropical and semi-tropical countries. When a form of filariasis arises, it seems to be due to a blocking of lymphatics, either by the adult or by the embryo. Hence arise chyluria, elephantiasis, lymphangitis, and other lymphatic diseases, described under their respective headings.

Filberts are distinguished from hazel-nuts by the prolongation of the husk beyond the point of the nut within. They can be grown successfully on almost any soil.



Filberts.

1, Section of fruit; 2, nut.

Fildes, Sir Luke (1844-1927), English artist, was born at Liverpool. After having illustrated books and magazines for several years, he applied himself to painting; he is chiefly known for his painting *The Doctor*, 1892, now in the Tate Gallery.

File, a steel implement used for smoothing rough surfaces by abrasion. It is usually fitted into a wooden handle for ease in manipulation, the portion which enters the wood being known as the 'tang.' Its working surface is covered by a series of more or less parallel ridges which are produced by the cuts of a chisel. The file is said to be 'single-cut' or 'float' if a single series of parallel ridges covers its surface; 'double-cut' if these are crossed obliquely by a second and finer set. 'Single-cut' files are used for working brass and copper, 'double-cut' for iron and steel.

Filene, Edward A. (1860-1937), merchant, was born in Salem, Mass. Largely through his efforts were organized the Chamber of Commerce of Boston and that of the United States. He served as president of William Filene's Sons Co.; Chairman of the Industrial Relations Committee; Chairman of the War Shipping Committee; organizer of European Peace Awards.

File-fish, a member of the genus *Monacanthus* of tropical and semi-tropical bony fishes. The body is covered with small, rough scales so that the skin can be used for polishing, while eight strong teeth are present in both jaws. Certain species occur on the southerly coasts of the United States, and the

'barnacle eater' is found as far north as the New England coast.

Filibuster, a term of doubtful origin, which was used in the 17th century almost synonymously with buccaneer, but which in the 19th century came to be applied to any one who in disregard of international law invades or attempts to overturn the government of a foreign state. Specifically, the term is generally applied to those residents in the United States who, during the 19th century, organized or joined expeditions fitted out in the United States for the purpose of gaining possession of the governments of Spanish-American countries or of aiding those countries to gain independence from Spain. Later the term came to be applied, in American politics, to legislators, especially in congress, who delay or prevent the passage of a bill by resorting to irregular methods of opposition.

Filigree, a kind of metal lace, generally made of unalloyed silver, melted and drawn out in wire which is beaten flat, tightly twisted, and again beaten, thus acquiring a serrated edge. The wire is then woven into patterns, and soldered at the points of junction. The ancient Greeks were especially famous for their beautiful filigree work. Central Asia has always been celebrated for the work; in Europe, Malta has produced it so largely that it is known as Maltese work; Norwegian specimens, however, are much superior. Ireland produced good work of this class in the 10th and 11th centuries and Mediæval Venice was renowned in this connection.

Fillet, in architecture, a small, square, flat section in the mouldings of a cornice or between the flutes of a column.

Fillmore, Millard (1800-74), the thirteenth President of the United States, was born at what is now Summer Hill, Cayuga co., New York, on Feb. 7, 1800. He was reared on a farm, and at the age of fourteen he was bound apprentice to a clothier and wool carder. In 1819 he began the study of law, and was admitted to the Buffalo bar in 1823. In 1828 Fillmore began his political career as a member of the State legislature. During the period 1832-42 he was four times elected a Member of Congress. In 1848 he was elected Vice-President of the United States on the Whig ticket with Zachary Taylor.

On the unexpected death of President Taylor, July 9, 1850, Fillmore became President, serving until March, 1853. He proved an able statesman, and his Presidency was marked by the passing of many salutary measures, notwithstanding that his party was

in the minority. During his administration diplomatic relations with Japan were established. His signing of and attempts to enforce the Fugitive Slave Act rendered him unpopular in the North, however, and he failed to secure a renomination in 1852.

Film, in photography, a flexible sheet of celluloid or like material upon which is spread a thin, sensitized coating for the making of pictures; a similar sheet bearing the completed picture; also the sensitized coating of photographic plates. Films are manufactured in rollable ribbon form, or in cut sheets for use in plate holders or special containers.

Filmer, Sir Robert (c. 1580-1653), English political writer, was born in Kent. His fame rests on the *Patriarcha*, 1681, an argument for the patriarchal origin of government, the fallacy of which was later exposed by Locke.

Filmy Ferns, an order of ferns, including more than two hundred species, which grow in large, spreading, mossy masses on rocks and tree stems in moist places. They are chiefly tropical, rare in the Southern Hemisphere, still rarer in the Northern.

Filters and Filtration. Filtration is the process of mechanically separating solid particles from the liquid in which they are suspended, by means of certain porous media known as filters, the interstices of which are too small to admit of the passage of the solid matter. The filtering layer may consist of numerous loose, detached particles, such as sand or charcoal; of compact bodies, such as tiles or biscuit porcelain; or of woven or felted material, such as cloth or paper. The liquid may pass through solely by gravity, or its out-flow may be accelerated by the use of a filter pump, whereby the air beneath the separating medium is partly exhausted. Water is purified on a large scale by filtration through sand, with or without the addition of chemicals.

Sewage filtration is a different process from ordinary water purification, being primarily designed not to strain out disease germs, but to secure the oxidation of putrescible organic matter by the action of nitrifying bacteria. When sand is used, the sewage is applied intermittently, so as to allow air to enter for the oxidizing process. Sometimes the same result is attained by permitting the sewage to stand in or trickle through a bed of coarse stone or similar material. In the chemical industries, filters of woven materials are largely employed, especially where the liquid contains mucilaginous or other matter that would clog the pores of an ordinary filter.

Another means of filtration which finds ex-

tensive industrial application is the filter press. This consists of a number of plates covered with filter cloth, so arranged as to form a series of hollow spaces into which the liquid is forced, the solid matter being retained by the cloth.

Ultra Filtration is the term applied by physical chemists to the removal of particles below the limit of ordinary microscopic vision which can be seen only by the ultra microscope, but which may be filtered out by means of parchment, collodion, and similar membranes. The extraordinary powers of charcoal in disinfecting the gaseous products evolved from decomposing animal and vegetable matter have been made available in constructing an apparatus for purifying air that is made to pass through it.

Fimbriate in biology means fringed; in heraldry it refers to a narrow border running round a bearing.

Finale, the name given to that part of a musical composition which finishes the act of an opera; also to the last movement of an instrumental composition.

Finance, Public, is the science which deals with the receipts and expenditures of government. In the mediæval state, governmental operations were simple, and expenditures were met by the personal revenues of the sovereign, or by gifts or fees for justice, protection, etc. In its modern form the science of public finance is usually divided into the study of Public Expenditures, Public Revenue, and Public Debt.

Public Expenditures differ widely in their extent and character, according to economic and social conditions, and according to the general attitude of the people toward government. The principal expenditures of a modern state are for defence against foreign enemies and domestic disorder; for education; for the relief of poverty and sickness; for advancing the material interests of the state, through construction of roads, streets, and public buildings, and through the carrying on of services requiring collective action, as the postal service and, in some countries, railway transportation and other public utilities; and for the support of government administration.

In a federal government like that of the United States, expenditures must be distributed between the central and the State governments, and further, among the governments of the cities, counties, and towns. While the line is not sharply drawn between expenditures of the different governments, the cost of national defence against foreign foes is borne by the central government, as are also the cost

of supplying services requiring uniformity throughout the country, as the postal service, and the cost of regulating commercial relations which pass beyond a single State. The expenditures for protection against internal disorder are borne in part by the State government, in part by the local government; and the same is true of expenditures for education.

The revenues of a modern state are derived from a great variety of sources. On account of important legal and economic differences, these are commonly classified as (1) permanent revenues, which include revenues from: public domain, fines, penalties, license fees, revenues derived from municipally owned utilities, and taxes and assessments; and (2) temporary revenues, which comprise revenues from government loans, treasury notes, bonds, and other short term instruments.

Under modern conditions adequate revenues are a *sine qua non* for the successful existence of government. Recent years have afforded frequent, sometimes tragic illustrations of this fact in the desperate efforts made by newly established governments to develop adequate sources of revenue. In the United States this fact was recognized at the formation of the Federal Government by the provision that each State should have independent control over its own revenues, subject only to very general provisions of the Federal Constitution, designed to protect private property and individual liberty and to reserve to the Federal Government control over foreign and interstate commerce. The Constitution gives the Federal government the power to collect taxes, duties, excises and imposts but prohibits it from imposing a capitation or other direct tax except in proportion to the population. This excludes the Federal government from the field of direct taxation, which is left to the States.

Three requisites of an efficient revenue system are generally recognized. In the first place it must provide sufficient revenue to meet the needs of the government and to carry on the various functions requiring collective action. In the second place, it must provide a steady income; either a deficit or a surplus in revenues may react unfavorably upon business, as well as upon the orderly processes of government. The third requisite is elasticity, allowing expansion in time of sudden need and contraction when undue surpluses begin to make their appearance. For a detailed account of the finances of the Federal Government, see UNITED STATES; TAXATION; CURRENCY.

Financial Panics. See **Crises, Economic.**
Finback, Finner, Fin Whale, or Rorqual,

any of four widely distributed species of whale-bone whales of the genus *Balenoptera*. Their bodies are slender and elongated; and they have a well-developed dorsal fin placed two-thirds of the distance from the head to the flukes, and a characteristic series of longitudinal folds in the throat region.

Finch, a name popularly applied to all the members of the family *Fringillida*, which includes a large number of small passerine birds such as the Sparrow, Linnet, Grosbeak, Goldfinch, Canary, and many others. The family comprises more than 1,000 species, and is widely distributed over the Northern and Temperate zones of both hemispheres, except Australia, where it is unknown. Characteristic features are the stout, conical bill, and the presence of nine primary quills. There are bristles at the gape, and the nostrils are concealed by feathers or by a membrane. The color varies from the sober plumage of the house sparrow to the brilliant red and black of the cardinal; the power of song may be absent or highly developed. Finches frequent wooded districts and open grassy places. They eat seeds, insects, buds, and leaves.

Finch, Heneage, First Earl of Nottingham (1621-82), lord chancellor of England, became successively solicitor-general, attorney-general, and lord chancellor, 1674. He presided at the impeachment trial of Viscount Stafford, in 1680.

Finck, Henry Theophilus (1854-1926), American musical critic, became musical critic and general editorial writer on the *New York Evening Post* in 1881, and did much to stimulate popular interest in Wagnerian music in America. He made special studies of Chopin, Liszt, Grieg, and MacDowell. Among his works are: *Chopin and Other Musical Essays* (1889); *Wagner and His Works* (1893); *Pictorial Wagner* (1899); *Grieg and His Music* (1909); *One Hundred Songs by Ten Composers* (1917); *Musical Progress* (1923).

Fin de Siècle ('end of the century'), a French phrase popularly applied, during the closing years of the 19th century, to whatever was most up to date or advanced in fashion, ideas, etc.

Findlay, city, Ohio, is the seat of Findlay College. The city has machine shops and foundries, brick and tile works, sugar and oil refineries, iron and steel works, and furniture, pottery, casket, drug, rubber tire, cigar, and shoe factories; p. 20, 116.

Findlay College, a co-educational institution at Findlay, Ohio, founded in 1884 under the auspices of the Churches of God. It has

classical, scientific, normal, theological, and preparatory departments, a business college, and schools of music and expression.

Fine, a law term of two unconnected sets of meaning, one of them now obsolete, but historically much the more important. (1) A money penalty for a misdemeanor. The practice arose in England about 1300, under Edward I. Imprisonment was the legal penalty for certain offences; but from favor to the powerful, or impossibility of enforcing it on them, they were allowed to 'make an end' of it by compounding it for money. Here the fine was not primarily a penalty, but just the reverse, an escape from one. In general, this alternative still persists, but exactly inverts the old idea. The magistrate lays a fine, and imprisons the culprit if unable to pay it. (2) Form of conveyance of lands at common law through the medium of a fictitious suit, employed in cases where an ordinary conveyance would not have the effect of vesting the full estate to be conveyed.

Fine, Henry Burchard (1858-1928), American educator and mathematician. He was dean of the Princeton faculty from 1903 to 1912, and in 1909 became dean of the department of science. He published: *The Number System of Algebra* (1891); *A College Algebra* (1905); and numerous papers on mathematical subjects.

Fine Arts, a general name for a whole group of human activities divided broadly into the major or greater fine arts of Architecture, Music, Painting, Poetry, and Sculpture, and their minor or subsidiary arts.

Fine Arts Commission. See **Commission of Fine Arts**.

Fingal, Finn, Fionn, or Find, an Irish epic hero, the great leader of the Fenians, Fingalians, Fians, Fianna, or Feinne, a band of professional warriors belonging, according to Gaelic tradition, to about the 3d century A.D. A great body of tradition, much of it conflicting, has gathered about the name of Fingal, but there seems to be little doubt that he was an actual historical personage.

Fingal's Cave. See **Staffa**.

Finger. See **Hand**.

Finger Prints, a method of personal identification, widely employed at the present day. In finger-print systems the fingers are inked, and impressions taken on cards, which are then classified and filed. Such a system determines identity with absolute certainty, if the prints of three or more fingers are compared; for finger prints remain the same through all other bodily changes, and even after death, as

long as the body lasts. Not once in 10,000 years, it has been estimated, would the finger prints of a person be duplicated.

The use of finger or thumb prints dates back to very early times, and recent researches show that as long ago as 200 B.C. the Chinese resorted to an impression of the thumb as the signature for business and legal transactions. In 1858 Sir William Herschel, of the Indian civil service, introduced the practice of taking finger prints when he was in executive charge of the Hugli district, Bengal, in order to prevent impersonation.

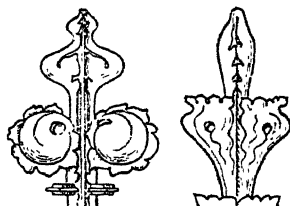
In England a committee appointed in 1900 had placed before it the results of the working in India of the finger-print method under Henry's classification, and on its recommendation the Home Secretary in 1901 sanctioned the adoption of the system by the police of England and Wales, in place of the anthropometric system.

In the United States the system is now used in the police departments of all the large cities; in the War Department and the Marine Corps, to detect deserters attempting to re-enlist; in the Interior Department for making agreements with Indians who cannot write; and in the work of the Bureau of Investigation of the Department of Justice.

The term finger print or impression is applied to any reproduction of the ridges on the nail joint of the finger, whether by means of ink, blood, or the sweat from the finger itself. Every system of identification is based on the general formation of these ridges, of the two fixed points therein, and of the ridges surrounding these points. The usual appliances for obtaining finger prints consist of a slab of tin, marble, glass, aluminum, or other hard, smooth substance, over which a thin film of printers' ink is spread by a wooden cylinder, upon which a piece of rubber tubing has been tightly stretched. Impressions are usually taken in two ways on ordinary white paper with the surface not too highly glazed; these are called rolled and plain impressions. To take a rolled impression, the bulb of the finger is placed on the inked slab, and the finger turned over until the bulb, which originally faced to the left, faces to the right. It is then pressed lightly and in the same way upon the paper. A plain impression is secured by placing the bulb of the finger on the inked slab, and then impressing it on the paper without any turning movement. The standardized procedure at the present time is to take both rolled and plain impressions. The complete record of such a set of impressions, as used by the Department of

Justice, is contained on a card eight inches square, and can be taken by an expert in less than a minute.

Finial, an ornament, generally carved to resemble foliage, which forms the termination of pinnacles, gables, spires, and other portions of Gothic architecture.



Forms of Finials.

Finiguerra, Maso (1410-61), Italian goldsmith and engraver, was born in Florence. Vasari ascribes to him the invention of printing designs from engravings on metal. Many proofs ascribed to him still exist, notably *The Crowning of the Virgin* in the National Library, Paris.

Fining, or Clarification, the process of clearing turbid liquors, such as beer, wine, or spirits. The simplest method is by filtration, which is sufficient for the removal of impurities mechanically suspended, but which will not successfully remove mucilaginous or other gummy material. Isinglass, ox blood, and potassium ferrocyanide are also sometimes used for clarifying wines.

Finistere, extreme western department of France, bounded on three sides by the Atlantic Ocean. It is traversed from east to west by two low but picturesque chains of hills; its coast is rugged and broken, its shores bristling with dangerous granite rocks, and fringed with many islands. The temperature in general is low, the climate humid. The sardine fisheries are important. Shipbuilding is carried on at Brest, and linen is manufactured at Landerneau. There are lead mines of considerable value. Area 2,729 sq. m.; p. 762,514.

Fink, Albert (1827-97), American civil engineer, was born near Frankfort-on-the-Main, Germany, and emigrated to America, 1849, where he constructed the first important iron bridges in the country. He was chief engineer and superintendent of the road and machinery department of the Federal Army during the Civil War.

Finland, formerly a grand duchy or principality of Russia, declared its independence Dec. 7, 1917. It lies, roughly speaking, be-

tween 60° and 70° n., and between 20° and 33° e., with the Gulf of Bothnia on the west and the Gulf of Finland on the south; its total area is 144,255 sq. m.

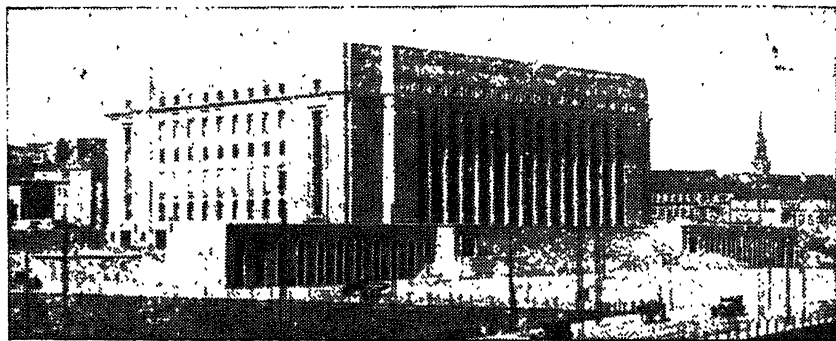
In its granite formations, indented lakes, and rocky basins filled with water, Finland resembles Sweden; in its absence of mountains, or even of hills, it is not unlike the Russian plains. The interior of the country is occupied by countless lakes, some of vast size, and mostly connected with one another naturally or artificially by means of canals. The climate is severe in winter, but is dry and hot in summer.

Among wild animals are the bear, wolf, fox, lynx, ermine, otter, and hare. Salmon, trout, perch, pike, gwyniad, and other fish abound

The manufacturing industries of Finland have developed greatly since the latter part of the 19th century. The principal industrial establishments are wood-working plants—saw mills, planing mills, plywood factories, reel and bobbin works—and paper and pulp mills.

The population of Finland is estimated at 3,611,791. Over 80 per cent. of the people are Finnish speaking; between 11 and 12 per cent. speak Swedish; the remainder Russian, German, and Lapponic. Finland is known for its excellent educational system and for the very low rate of illiteracy. There are universities in Helsingfors and Abo.

Under the Russian régime the emperors of Russia were at the same time grand dukes of Finland. In accordance with the proclamation



Scene in Helsingfors, Finland.

in most of the rivers, and fishing gives employment to a large portion of the population.

The forests are of vast extent, covering nearly 50,000,000 acres. More than half belong to the state. Northern pine and Norway spruce are the most widespread and productive; then come the birch, alder, ash, and oak. The national industries depend largely upon the forests, and forest products form the most important part of the country's exports.

More than 65 per cent. of the population is engaged in agriculture. The principal crops are oats, autumn rye, barley, potatoes, and hay. Cattle raising and dairy farming have made rapid progress in recent decades, butter, cheese, and beef being exported. Agriculture is encouraged by land purchase legislation (1918) under which every tenant has the opportunity of becoming owner of his leasehold. Another important factor in recent agricultural development has been the co-operative movement, especially as represented by agricultural credit societies and co-operative creameries.

of Dec. 7, 1917, the government is a Republic headed by a president, elected for 6 years, and a House of Representatives.

About the end of the 7th century the Finns, driven as it is supposed by the Bulgarians from their settlements on the Volga, took possession of the country they now occupy. In the 12th century the Swedes turned their attention to Finland, more especially for the introduction of Christianity. Three separate crusades (1157, 1249, 1293) finally brought about the subjection of the country to Sweden, and the adoption of the Christian religion.

In 1721, by the Treaty of Nystad, Peter the Great annexed to Russia not only Ingria and Livonia, but also a great part of Karelia, including Viborg. In 1743, by the Peace of Abo, the Empress Elizabeth extended Russian Finland to the Kymene; and in 1809 the entire principality was conquered by Alexander I.

In 1899 a manifesto asserted the right of Russia to legislate in Finland without the consent of the Finnish Diet on any matter bearing

on Russian interests; in 1900 the Russian language was ordained as the official language; and in 1901 the Finnish military system was superseded by the Russian.

With the outbreak of the Great War in 1914, still further measures were taken to strengthen Russian control. The Russian Revolution, March, 1917, however weakened Russia's hold, and on July 20, 1917, the Finnish Diet proclaimed the independence of Finland, which it further defined in Oct. 7, 1917, as a republic within Russia. Complete independence was declared on Dec. 6, 1917.

A republican form of government was determined upon, and the constitution was rati-

Finland refused the demands. Both nations massed troops along their common frontier. On Nov. 25 Russia broke off diplomatic relations with Finland. Five days later Soviet troops attacked simultaneously in the far north, in the Lake Ladoga region, and along the eastern Finnish border. Russian planes subjected unfortified Helsingfors to violent air attacks and the Russian navy bombarded coastal cities. Finland's small army fought valiantly but was gradually pushed back by the Russians. On March 13, 1940, Finland surrendered. When Germany attacked Russia in 1941 Finland joined with the Nazis, passively participating in the war. This led to



A Norwegian Fiord.

fied at Helsingfors, June 21, 1919. While large nations were defaulting on their war debts to the United States, Finland continued to make her semi-annual payments.

Russia, in the fall of 1939, after seizing half of Poland and winning concessions from Lithuania, Esthonia, and Latvia, continued seeking a complete diplomatic conquest of the Baltic nations by summoning a Finnish delegation to Moscow and demanding the cession of certain islands in the Gulf of Finland and a strip of land north of Leningrad. In return Russia offered to cede to her tiny neighbor a portion of her domain within the Arctic circle. After a number of conferences

a break with the Allied nations. In 1944 Russia secured an armistice and the Germans withdrew from Finland. In 1945 the country declared war on Germany.

Finland, Gulf of, an arm of the Baltic Sea, between Finland and Esthonia.

Finland: Language and Literature.—*Suomi*, the language of the Finns belongs to the Finno-Ugric branch of the Uralo-Altaic family, and is closely allied to the Magyar or Hungarian. Most of Shakespeare's plays have been translated into Finnish by P. Cajander, and the standard works of England, France, Germany, and Russia have long since been rendered into that language. There

are a great many Swedish and Finnish newspapers, and scientific or literary journals. The Society of Finnish Literature has fostered the editing of precious collections of epical songs, ballads, and fables.

Finley, John Huston (1863-1940), American educator, administrator, and author, was born in Grand Ridge, Ill. Five years after his graduation from Knox College he was elected its president, 1892, serving until 1899, when he returned to New York to engage in journalistic work. In 1903 he became president of the College of the City of New York, and was chosen President of the University of the State of New York and Commissioner of Education, 1913, where he remained until 1921, when he became editor-in-chief of the *New York Times*. He served as a member of the arbitration board in the Eastern railway controversy, 1913, as chairman of the State Commission for the Blind, 1913-15, and as Commissioner of the Red Cross to Palestine and the Near East, 1918-19. He was the author of *Taxation in American States and Cities* (with Richard T. Ely, 1888); *French Schools in War Time* (1917); *A Pilgrim in Palestine* (1919).

Finley, John Park (1854-), American meteorologist. He devised the system of weather reporting by volunteer observers, and invented signal apparatus used in army signaling, and made valuable meteorological studies, especially on tornadoes. His published works include: *Manual of Instruction in Optical Telegraphy* (1889); *Essay on the Development of Tornadoes* (1890).

Finley, Robert (1772-1817), American clergyman, was born in Princeton, N. J. To him is largely due the formation of the American Colonization Society for colonizing parts of Africa with emancipated slaves. In 1817 he became president of the Franklin College, Athens, Ga.

Finmark, the most northerly province of Norway, consists of a narrow strip of rocky coast land. The chief sources of wealth are fishing and reindeer breeding. Area, 18,000 sq. m.; p. 44, 190.

Finn, Henry J. (1782-1840), American actor, was born in New York City. He achieved success in eccentric parts, such as *Paul Pry* and *Dr. Pangloss*, and subsequently starred in various cities with monologue variety entertainments. He perished in the ill-fated *Lexington*, which was burned in Long Island Sound.

Finney, Charles Grandison (1792-1875), American clergyman and evangelist, was born in Warren, Conn. In 1834 he became the first pastor of the Broadway Tabernacle, New

York City; in 1835 was made professor of theology at Oberlin College; and from 1851 to 1866 served as president of the College. He founded and edited *The Oberlin Evangelist* (1839-63).

Fins, membranous processes whereby fish and other aquatic animals propel, balance, and steer themselves in the water. They may consist of simple cutaneous folds; but in fish they are usually supported by bony or cartilaginous rods or rays. The fins of the fish are of two kinds—paired and unpaired, or median. There are two sets of paired fins, the pectoral and ventral, articulated respectively to the shoulder girdle and the pelvic girdle, and corresponding to the anterior and posterior limbs of the higher vertebrates. Various modifications occur.

Finsen, Niels Ryberg (1860-1904), Danish physician. By a series of researches he showed that the effects of light upon biological processes are mainly due to the violet and ultraviolet rays of the spectrum. The *Finsen Light*, employed to destroy certain pathogenic organisms, concentrates the rays of an electric arc lamp by means of a lens composed of one flat and one curved disc, between which is interposed a solution of copper sulphate. In 1896 an institute was established in Copenhagen, under Finsen's supervision, for the treatment of diseases. In 1903 he was awarded the Nobel Prize for medicine. He wrote: *Chemical Rays and Variola* (1894); *Phototherapy* (1901). Consult *Dickson's Life*.

Fjord, Fyord, or Fjord (Danish), is a glaciated valley partly filled by the sea. It possesses the characteristic U section of such a valley, and has steep sides, over which small streams fall in cascades. Fiords are shallower at the mouth than farther inland, owing to morainic accumulations; they are formed by the drowning of old glaciated valleys due either to crustal or sea-level changes, or to the melting of the ice which filled the valley below the level of the sea. They are independent of rock structures, for they occur in young folded mountains in North and South America and in New Zealand, in old denudation highlands on both sides of the northern part of the Atlantic. The best known are the fiords of Norway and the sea-lochs of West Scotland. Fiords form excellent harbors, but as they have no easily accessible hinterland they are of little commercial importance, except for fishermen.

Fir is a term loosely applied to several conifers, but should be confined to the genus *Abies*, characterized by its leaves growing spirally round the branches. The balsam fir,

with dark foliage fragrant when drying, and used for cushions, is found in Canada and the north-eastern states. The silver fir of the south of Europe is distinguished by flat leaves and erect cones; the spruce fir has tetragonous leaves and drooping cones. The common or Norway spruce fir is widely distributed over North and Central Europe, and flourishes in situations much too severe for any of the pines. The timber of this tree is the deal of commerce, and is also imported, unsawn, for masts, etc. Burgundy pitch is another product of the spruce fir.

Fir-Bolg, the name given in Gaelic traditional history to one of the earliest races of Ireland. They are said to have come from Greece, where they worked as serfs. Modern ethnologists agree in believing them to have been of Iberian stock. small of stature and dark in complexion. They are stated to have colonized Ireland as victorious invaders, but to have been conquered in their turn by the Danaans. Skene regards as authentic the statement that Fir-Bolg refugees, ousted from Ireland by the Gaels, settled in the Isle of Man, Arran, and the Hebrides, and there are still the ruins of a Fir-Bolg fort at St. Kilda.

Firdausi, or **Ferdusi** (c. 940-1020), the poetical title of Abu'l Kasim Mansur, Persian poet, author of the great epic, *Shāhnāmāh*, or *Book of Kings*, which contains the legendary annals of the ancient monarchs of Persia down to the Arab invasion in 651 A.D. Firdausi, a native of Tus, labored upon the *Shāhnāmāh* for thirty-five years, and then presented the book to Mahmud.

Fire. From the earliest ages man has been able to originate fire, and with its aid to cook his food. The difficulty of starting the flame would, to the savage, be great, and consequently the desire of never allowing it to become extinguished gave rise to the maintaining of special fires under a professional class, which soon became the mysterious and sacred fires of the temples.

Early methods of producing fire are based, in a variety of ways, on the application of friction, as in the rubbing together of two pieces of wood, or of concussion, as in the impact of flint and steel. One of the simplest frictional arrangements is what Mr. Hough calls the fire-plough, a pointed stick run along a groove in a piece of wood lying on the ground. Many improvements upon this method have been found—the bow-drill of the Eskimo, and the pump-drill of the Iroquois Indians. The use of flint and steel may have developed at a very early period; certainly its origin is lost

in antiquity. There is also a social history of fire, a mythology which includes the various phases of fire-worship with its ceremonies and observances, and a folklore of magnitude and surpassing interest. See also PARSEES, and ZOROASTER. For the physics and chemistry of fire. see COMBUSTION, FLAME, and FUELS.

Fire Alarms. See **Electric Bells and Alarms**.

Firearms. Buckle says that cannon were used in war before the middle of the 14th century, and in a MS. belonging to Christ Church, Oxford, dated 1326, there is a picture of a cannon fired by gunpowder. In the course of a century various improvements were effected, and Louis XI. of France, in his Flemish campaign, 1477, is said to have used 'bombards of great length and power, some with stone balls and some with iron.' In 1537 the Honorable Artillery Company was incorporated.

The cannon of this period were made of cast iron, of bronze, and of brass. The term *culverin* was applied to guns of unusual length which carried iron balls weighing 18 lbs.; while the name *mortar* was given to the short-chambered pieces used for throwing stone balls at high angles of elevation. Dutch artilleryists invented the howitzer, a short gun mounted upon a field carriage. In 1799 a short cannon of large caliber was invented at the Carron ironworks in Scotland for use as a naval gun—hence the term *carronade*. In 1747 the French discovered that the fuse of the shell could be ignited on discharge by omitting the tamping around the shell, which expedited loading and increased the safety of fire.

In the early part of the 19th century the *columbiad*, a gun adapted for firing both solid shot and shell at low angles, was invented in the United States by Colonel Bomford. This type of gun prevailed until 1859, when General Rodman, of the U. S. Ordnance Department, by his inventions revolutionized the making of heavy ordnance.

Breech-loading devices were first used about 1500, and then for small guns only. The subsequent creations of Krupp, Armstrong, Palliser, and Whitworth belong to the modern history of firearms. The first invented firearm for infantry was the *arquebus*. It has been described as having a match or fuse fixed in cock, and fired by a trigger pulling it down to ignite the priming in the pan. It took a quarter of an hour to charge and fire one. These arquebuses, matchlocks, or muskets are first mentioned in 1471, and passed through a variety of forms culminating in the wheel-lock about 1515. The flintlock was a Spanish inven-

tion of the early 16th century; it followed the wheel-lock, and its principal advantage was the more simple method of lighting the priming in the pan.

The flintlock remained in use until the middle of the 19th century, the various forms being classed as carbines, rifles, muskets, and fusils. In 1844 the British infantry was armed partly with the old flintlocks and partly with 'the new pattern percussion arm.' The next decade brought forth the Prussian needle-gun, or breech-loader, by the aid of which 20,000 Austrians were in twenty minutes repulsed with a loss of 279 officers, 10,000 men, and 23 field-guns. This occurred in 1866, and all modern armies were soon supplied with small arms of similar pattern.

Pistols have always been used as a cavalry firearm: a specimen dated 1625 exists at the ordnance office in Dublin. The revolver was invented in the 17th century, but the renowned 'Colt' variety was not evolved until 1835. See ARTILLERY; GUNS; REVOLVERS; RIFLE. Consult Deane's *History and Science of Firearms*; Jervis' *Our Engines of War*.

Fireball, a kind of military firework formerly in use. It was thrown from a mortar to light up the position of an enemy.

Firebote, the right of a tenant, according to English law, to cut wood on the estate for the purpose of fuel.

Firebrick, a substance used for lining flues, furnaces, ovens, retorts, and converters. In metallurgical operations it is made most generally of fireclay; but for special purposes, of silica, magnesite, bauxite, or chrome iron ore.

Fireclays are clays which fuse with difficulty when exposed to very high temperatures, and are valuable in consequence for making firebrick. A satisfactory fireclay is easily moulded and made into bricks and similar articles. It is composed chiefly of silica and alumina, with a small percentage of iron oxide, and sometimes a trace of potash, soda, or other alkali.

Fire Department, an organization made up of either volunteers or paid workers in a community, for the purpose of preventing and controlling the outbreak of fire. Fire departments range in numerical strength from a few volunteers forming a bucket brigade, or with a small truck carrying buckets, fire extinguishers, ladders, hooks, and axes—the outfit being owned by the volunteer members, and the whole supported without expense to the community—to that of the City of New York, which is the largest in the world.

In the larger cities and the more important industrial and commercial centers, 'full pay'

fire departments are the rule. All of the firemen devote their entire time to fire service and receive regular compensation, while all apparatus and property are owned by the community, and all expenses of maintenance are borne by it.

Most of the larger departments are controlled by one or more commissioners, appointed by the mayor and city council, who direct the civic and administrative affairs of the department; while the chief engineer, usually appointed by the commission, has entire control of the fire-fighting section. The 'full-pay' department is undoubtedly the most efficient for the larger cities, resulting not only in the saving of life from fire but in reduced fire losses and, therefore, lower fire insurance rates, so that communities are well compensated for the money spent in supporting such departments.

Fire departments organized on the volunteer basis are by far the most numerous, and are to be found in almost every small town in the country. Some of these departments own all of the fire apparatus, houses, outfit, and trucks, and operate without cost to the taxpayers, being supported by the dues and fines of members, by donations, and by the proceeds from entertainments. In other places, the apparatus is owned by the public, who pay the cost of maintenance. Social organizations, supported by the members, are usually a feature of such departments. In some communities the firemen receive a set sum per year from the town or village; in others the authorities grant a small sum to the firemen for every fire attended.

In addition to the public fire departments there are throughout the country many first-class private fire departments, supported by industrial organizations and institutions, the equipment of which is of the most approved and effective character. Many large plants are fitted to attack fire within the danger zone of their own premises. Some railroad companies have equipped their yard engines with pumps for use at their own and contiguous fires, and many harbor tugs and steamboats are prompt to assist, in so far as they can, the work of the fire departments.

New York City Fire Department.—The department, with headquarters in the Municipal Building, has a membership of 6809 men. The Fire Commissioner is appointed by the Mayor and receives a salary of \$15,000. In the service the departmental roster normally lists a chief, 34 deputy chiefs, 96 battalion chiefs, 1 chief medical officer, 9 medical

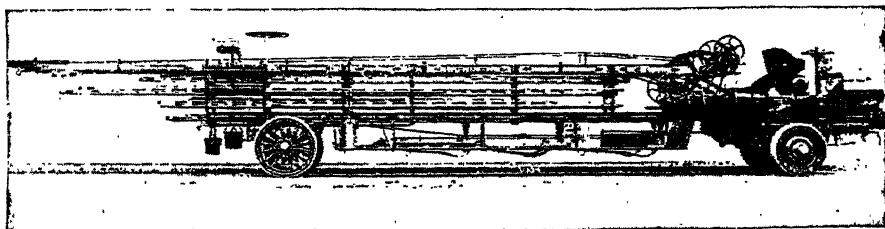
officers, 5 chaplains, 342 captains, 543 lieutenants, 94 engineers of steamer, 20 marine engineers, 24 pilots, and 5,629 firemen. There are 279 engine companies, 124 hook and ladder companies, 10 fireboats, and 4 rescue companies.

Fire-fighting Apparatus.—This includes chiefly fire engines, aerial ladders, water towers, fire alarms, chemical engines, and fire boats.

As commonly understood a fire engine is a portable pumping apparatus designed to throw water or chemicals to extinguish a fire. The main parts of a steam fire engine are the boiler, engine, pumps, and frame on which these are mounted. The boiler, engine and pumps are generally vertical, the two latter usually in duplicate. Motor-propelled fire engines have now replaced the horse-drawn ones in most instances.

are constructed to discharge up to a 2-inch stream, and from a point as high as 75 ft. above the ground.

Fire-Alarm Equipment.—In most cities what is known as the municipal fire-alarm system is in use. It is really a highly organized telegraphic system, partly automatic. In 1915 it was decided to reorganize the entire fire-alarm system of New York City and on June 21, 1922, the new system on Manhattan was formally opened. This system, which is one of the most complete in the world, cost the city \$1,750,000. Each fire house is connected with the central office, which is located in Central Park, by circuits entirely independent of the alarm box circuits. Alarms of fire are sent to central headquarters from the street boxes and are transmitted to the fire houses over the central office circuits. Between the hours



Courtesy of American-La France Fire Engine Co., Inc.

Aerial Ladder Truck.

The aerial ladder can be raised for fire work in half a minute, and this has been accomplished in 19 seconds. A chain of scaling ladders can be run up and secured into several stories of windows. This has been made possible by a combination of compressed coil springs and hydraulic (oil) power under a pressure of 7,000 pounds to the square inch. The lowering of the ladder compresses the spring that helps to raise it again. The ladder is superimposed on a geared ball-bearing turntable, by which it can be turned and inclined in any direction, after being raised to a perpendicular position. If necessary, the raising, turning, and lowering of these aerial ladders may be done by one man. The ladders are carried on trucks, along with the other necessary implements, such as axes, hooks, and rope life-net.

Water Towers.—In some cases in which it is essential to pour large streams of water into upper stories, it is impractical or dangerous to do so from ladders or deluge pipes. In such cases, water towers are used. These towers

of 8 A.M. and 8 P.M. the number of alarms, engines, and location of fires are broadcasted, as it is considered advisable to keep all stations in touch with the fires. After 8 P.M. only the station to which a fire is nearest is notified. Independent circuits are provided for notifying the chief, under-chiefs, fire-boat stations, and insurance patrols. Public schools and other public buildings are connected to the street-box system, each building having one box assigned to it. For description of fire-alarm systems see **ELECTRIC BELLS AND ALARMS.**

Fire Boats are a sort of marine fire-engine moored in harbors or along the water front of cities where the danger of fire damage to lumber yards, docks, piers and warehouses is great, and results are highly disastrous. The prime features of an efficient fire boat are speed, ease of manoeuvre, powerful pumps, and a large boiler capacity.

While in station, fire-boat pilots, engineers, and stokers stand regular watches on board, and the boilers are steamed up to 200 pound

pressure. By means of a slip electric shore connection, the fire alarm is received in the engine room and pilot house at the same time as at the shore quarters. Lines are cast off, engines started, and almost as quickly as in the case of the land companies, the fire boat starts for the fire.

Chemical Fire Engines.—The chemical fire engine is a valuable adjunct to fire department equipment. The tanks, which may be either horizontal or perpendicular, are filled with fresh water into which a given quantity of bicarbonate of soda has been dissolved. A given quantity of sulphuric acid is also sealed in a lead or glass container and placed in the water tank, the charging cap of which is then screwed tight. A contrivance, operated from the outside, either breaks the glass acid container or upsets the lead one, bringing the acid and soda water together, causing chemical reaction, and liberating carbonic acid gas. Pressure is thus developed to eject the gas-impregnated water upon the fire, where the carbonic acid gas is liberated, thus excluding air and assisting the water to extinguish the fire.

Automobile Fire Apparatus.—Motor-propelled and operated fire apparatus have been greatly improved in recent years.

High-Pressure Systems.—The best water system for fire protection and fire fighting in large cities is that known as the 'high pressure' system, installed with the view of fire service only, since the ordinary domestic water-supply systems seldom carry pressures beyond 75 pounds—a pressure too light to meet the requirements of present-day fire-fighting. Where the water supply is free and abundant; the head sufficiently high to give the necessary hydrostatic pressure; the mains and distribution pipes so sized, laid, and connected as to allow a maximum free gravity water flow to easy working hydrants of large caliber and free delivery; so spaced as to require but short fire hose lines, the high-pressure system is not only the best, but the most economical to maintain.

The New York City high-pressure fire system is the largest in America. Each pumping station has an allotted distributing territory but they can be thrown together or separated by means of electrically worked gate-valves operated from the main pumping station. All fire alarms in the high-pressure zone are received in the pumping stations, whereupon the pumps are instantly started.

Fire-extinguishing machines have been used from an early period. The Romans, in the time of Trajan, are said to have used 'leathern bags with metal pipes attached.' These were

filled with water, which was projected through the outlet pipe by pressing the sides of the bag. Hero of Alexandria, in 150 B.C., describes a siphon for use in conflagrations. During the 16th and 17th centuries large metal squirts were used in Britain and in Germany for extinguishing fire.

The fire engine which formed the basis upon which the more modern manual engine was built was introduced by Van der Heide, a Dutch engineer, who in 1670 made an engine and flexible leather hose. The first steam fire engine was built in 1829 in England. In the U. S., Cincinnati, where the Latta engine was constructed about 1850, had the first department regularly equipped with steam fire engines. The present fire department of New York City was organized on May 25, 1865. Where the manual engine is still in use, the water supply in towns has been brought to such a state of perfection that the use of a pumping engine is obviated by gravitation pressure in the water mains.

In 1941 the Committee on Firemen's Training of the National Fire Protection Association was organized. It published (1942) *Training Manual for Auxiliary Firemen.*

Fire Disasters. The first important fire of which we have authentic record is that of Rome, 65 A.D. The Christians have been accused of starting this fire by way of revenge for persecutions; while the Emperor Nero himself, who, it was said, was anxious to get rid of some unsightly corners of old Rome, is held responsible by many. The fire, starting in the Circus Maximus, spread without much opposition until it was beyond control; lasted for eight days, and destroyed the greater part of the city.

London was visited by fires of some proportions in the 8th, 10th, and 13th centuries; but the Great Fire of London, of which a full and vivid account is contained in Pepys' *Diary*, occurred in 1666. Early in the morning of Sunday, Sept. 2, it started from an unknown cause in a bakeshop in Pudding Lane, a street of wooden houses full of combustible material. Driven by a strong easterly wind, and favored by the dryness resulting from a long period of drought, and by failure in the water supply, this fire raged for six days. The burnt area amounted to 436 acres, and included 400 streets and lanes, 13,200 houses, 86 churches, besides St. Paul's Cathedral, Newgate and Fleet prisons, and three of the city gates.

The great Moscow fire of 1812 was started by Russian incendiaries after the occupation of the city by Napoleon's army. The army

and the inhabitants deserted the city on Napoleon's approach, taking with them the fire engines, and leaving in the houses quantities of combustible material. The fire, starting simultaneously in several parts of the city, raged for seven days, with little opposition from the disorganized French troops.

During the 19th century, many of the larger cities of America were partially destroyed by fire. The business section of New York was practically wiped out in 1835, with a loss of \$15,000,000, by a fire starting in a narrow, gale-swept street.

The great Chicago fire of 1871 is said to have started from the upsetting of a kerosene lamp. Drought and a high wind furnished favorable conditions, which, with the burning of the water-works, caused the flames to sweep over 2,124 acres. About 200 lives were lost, and nearly 100,000 people were rendered homeless.

A year later, a fire of unknown origin, starting in a wholesale drygoods house, found Boston with an insufficient water supply and horses disabled by distemper. Sixty-five acres were burned, with a loss of about a dozen lives and \$75,000,000.

The Hoboken pier and steamer fire of 1900 cost 215 lives and \$4,627,000. The burning of the steamer *General Slocum* in the East River in 1904 was one of the costliest in human lives recorded, the number of victims being 1,020.

The fire that succeeded the San Francisco earthquake in 1906 started simultaneously in several places, perhaps from crossed electric wires. The water mains had not withstood the earthquake shock, a gale arose, and only a little over 2 per cent. of the buildings were fireproof. The result was the laying waste of four square miles, and the loss of about 200 lives and \$350,000,000 worth of property.

In March, 1911, the loss of 145 lives in the factory of the Triangle Waist Company, N. Y. City, was caused by locked exits, insufficient fire escapes, etc. This disaster led to the formation of a Fire Protection Bureau in that city. Three days later, a \$5,000,000 fire in the N. Y. State Capitol in Albany wrecked the Assembly Hall and the greater part of the State Library.

Nov. 28, 1942 the Coconut Grove night club fire, Boston, caused a loss of 488 lives. Combustible decorations, inadequate exit facilities, and panic combined to cause the tragedy.

Fire losses in the United States for the year 1942 are estimated at \$314,849,000, a decrease of 7,508,000 from the 1941 loss.

Fire Eater, a name applied, before the U.

S. Civil War, to those Southerners who were especially radical in their opposition to the North.

Fire Extinguishers, apparatus by means of which fire may be extinguished, usually through spraying of liquids or water charged with a gas which is incapable of supporting combustion. An extinguisher of this type was successfully used in London in 1816, and a patent for a similar apparatus was applied for in the United States in 1837. These extinguishers are metal cylinders, partly filled with a solution of soluble carbonate, usually bicarbonate of soda. In the upper part of the cylinder is a glass receptacle which contains sulphuric acid and is closed with a loosely fitting stopper. When the apparatus is to be used, the cylinder is inverted and the acid mingles with the carbonate solution. Carbon dioxide is generated through decomposition in a sufficient quantity to saturate the liquid and produce internal pressure, which forces the carbonated liquid through a flexible nozzle. 'Hand grenades' contain, as a rule, a strong solution of salts, such as magnesium chloride, and owe their effectiveness probably as much to their applicability at the very first stages of a conflagration as to the specific action of the separated salt. Liquid fire-extinguishers are quite ineffective in the case of burning oil, as the oil floats on the surface of the liquid. Burning oil and draperies are best smothered with earth, sand, wet or dry rugs.

Firefly. See **Glow-worm**.

Fire Insurance. See **Insurance**.

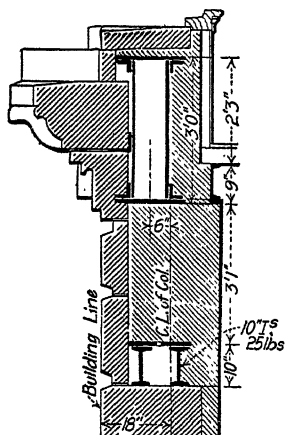
Fire Island, or **Great South Beach**, a flat sandbar, 45 m. long, off the s. shore of the middle of Long Island, separating Great South Bay from the Atlantic Ocean. The lighthouse near the w. end is one of the two points of the coast first sighted by incoming steamers. It has a light of the first order, 167 ft. above mean high water.

Fireproof Building Construction in its present-day form is a modern development, being a result of the progress of steel-framed brick or concrete floor construction, or broadly of steel-frame building construction. The reinforced-concrete building furnishes a type of fireproof structure in which steel beams are not necessary, but this is a product of the last decade, and in a sense is itself a development from steel construction. Fireproof floors of to-day are either terra-cotta, brick, or concrete.

Where reinforced concrete enters into the structure of a fireproof building, it is necessary that the reinforcing metal be covered every-

where by at least 1 to 2 ins. of concrete, to avoid all possibility of its being affected by the heat of a fire.

Complete fireproof construction is still enough higher in cost than wood or part wood construction to restrict its use to high-class buildings and buildings of special fire hazard. Even where the construction is essentially non-fireproof, however, the risk of fire loss may be greatly reduced by protective treatment of the most exposed or most dangerous portions. If the exterior walls and the roof are made fire-



Part of Front Wall of a 24-Story Office Building, showing how the Steel Girders are encased in the Masonry.

proof, the building has a smaller loss risk than if they are of wood, and at the same time offers less danger of setting other buildings on fire. Proper guarding of wall-openings by fire doors and shutters is necessary to make this protection of greatest value.

Fireproofing. (1) The process of making wood, paper, or textiles fire-resisting by impregnating or coating them with certain substances. Aluminum hydroxide and aluminum sulphate fulfil these conditions well; water-glass is an excellent surface coating for wood; while ammonium borate and phosphate are also satisfactory.

Fireproofed wood—wood rendered difficultly inflammable and slow-burning by impregnation—has attained considerable importance from the fact that the building laws of various cities permit its use for trim and other minor purposes in buildings which are required to be of fireproof construction. Fireproofing of

scenery, curtains, etc., is quite a general requirement in modern theater equipment. Paper more rarely requires fireproofing.

(2) The process of protecting all combustible surfaces in buildings, with facings of fireproof material; also, the facings and structural elements employed for this purpose. These fireproofing materials must be poor conductors of heat in order to serve their purpose. Porous cinder concrete is one of the best in this regard.

Fireproof Materials are those heat-resistant materials which are used in constructing fireproof buildings. In the case of protection materials, a low heat-conducting power is an important desideratum. The required qualities are well indicated by a regulation in force in New York City for fire tests of proposed methods of building fireproof floors. The under side of the floor being exposed for four hours to a fire of 1,800° F. average temperature, the floor must throughout carry its full intended load without excessive deflection, and without cracking, and must withstand a 1-1/8 in. fire stream, at 60 lbs. pressure, directed at the under side, from a distance of about 10 ft.; after cooling, must still be capable of carrying two to four times the designed load.

(a) Brick and other burned-clay products—as hollow terra-cotta blocks and tile—and concrete are the most perfect fireproof materials we possess. Rich stone or gravel concrete is used where strength is needed. Reinforced concrete is equally fireproof with plain concrete; no harmful effect of the heat on the embedded steel rods has been observed—at least, whenever their original depth below the surface was an inch. For details, see various sources, as U. S. Geological Survey *Reports* on Baltimore fire, 1904, and San Francisco fire, 1906; *Reports* of New York Department of Buildings (abstracts in *Engineering News*); *Reports* of U. S. Geological Survey.

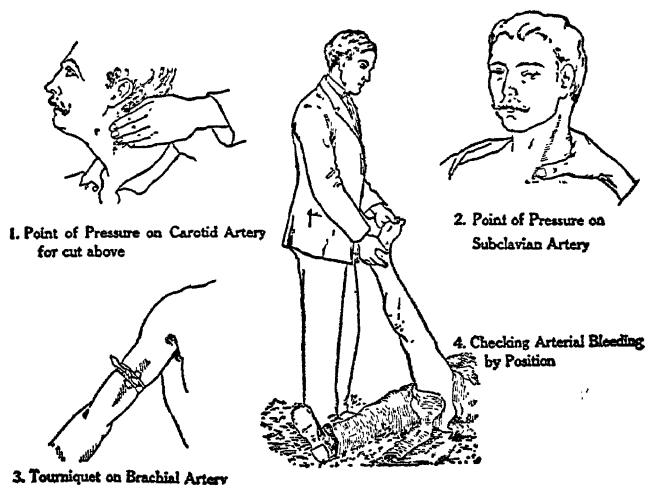
Fire Protection, municipal, the protection of a community against fire is usually assumed by the local government. In most municipalities the fire department includes the fire alarms and telegraph, the fire engines and other apparatus, and a carefully trained and well disciplined body of men. In most cities admission to the fire department now may be secured only through civil service examinations, where physical qualifications as well as the general intelligence of the candidates are tested by examinations. Practical and formal instruction are given in almost all modern fire departments to both ranking firemen as well as to probationers. Promotional examinations are required.

Fire Ship, a vessel filled with combustibles, sent in among a hostile squadron, and there fired, in the hope of destroying some of the ships. According to Livy, the Rhodians made use of fire ships in 190 B.C. In modern times fire ships were used with great effect at the siege of Antwerp in 1585; against the Spanish Armada in 1588; during all three of the great wars between England and the Netherlands; and in 1809 by Lord Cochrane against the French shipping in Aix Roads. Ships with ballast and combustibles were repeatedly used by the Japanese at Port Arthur, 1904, to block the channel of the harbor when the ships were exploded.

the 13th century. Steel and iron products, ribbons, and buttons are manufactured; p. 20,194.

Firozpur, or **Ferozepore**, cantonment and capital of Firozpur district, Punjab, India; a possession of the English. The largest arsenal in the Punjab is located here; p. 50,000. The district has an area of 4,302 sq. m., and a p. of about 1,000,000.

First Aid, a term applied to the more or less skilled emergency treatment of injuries before regular medical or surgical assistance can be obtained. It embraces the administration of emetic substances in cases of poisoning; the application of tourniquets in instances of



From the American Red Cross Abridged Text Book on First Aid.

Simple Methods to Arrest Hemorrhage.

Firkin, a small cask of liquids, fish, butter, etc., originally containing a quarter of a barrel. The word now denotes a wooden vessel of no fixed capacity.

Firmament, a word formerly used to signify the vault of heaven. The term found its way into English from the Vulgate, and was specially employed by the Hebrews to denote the hemisphere above the earth.

Firman, the name given to edicts issued by an Oriental prince, especially the Sultan of Turkey or one of his ministers. It also denotes a passport or permit of residence granted to foreigners in Turkey.

Firminy, town, department Loire, France. The coal mines nearby have been known since

severed arteries or vascular ruptures; use of artificial respiration in cases of electric shock, drowning, or of asphyxiation due to inhalation of gas fumes. It includes, in addition, the applying of splints to fractures, and of bandages and immediate relief to sprains, burns and other minor injuries. Special courses of training for this work are given by various welfare organizations, including the Red Cross, Y. M. C. A. and Y. W. C. A., Boy Scouts, and Girl Scouts, and Campfire Girls. See: *American Red Cross First Aid Text Book*, revised edition.

Firstborn. According to ancient Hebrew usage, the firstborn male offspring, both of men and animals, was sacred to Jehovah, and was

legally required to be offered in sacrifice. In the case of beasts, the firstborn male, if without blemish, was to be given to the priests; if blemished, it was not to be sacrificed but eaten at home. According to the older custom, the firstborn male children, though claimed by Jehovah, either as a sacrifice or as prospective priests, could be redeemed with money.

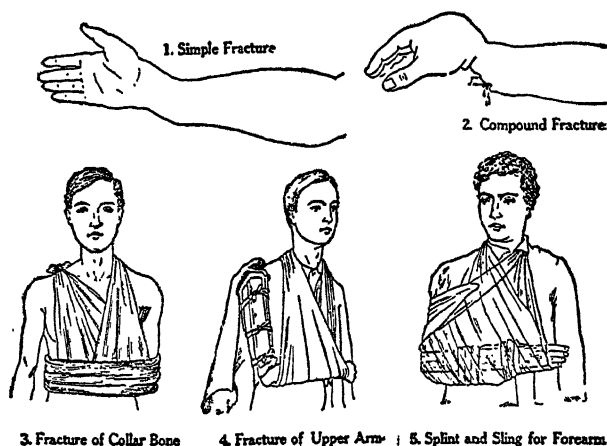
First Fruits, in Hebrew law, the earliest gathered produce of the soil, which was sacred to Jehovah or Yahweh, and offered to Him in sacrifice. Thus at the beginning of harvest a handful or sheaf of corn must be offered before the general reaping commenced; and when the grain had been safely gathered, an oblation of

tional, and insisting above all on German, not Latin, as the language of instruction.

Fischer, Emil (1852-1919), German scientist, received the Nobel Prize in 1902. His most important work was in connection with the synthetic production of the simple sugars, and his investigations into the constituents of coffee and tea, which opened the way to a new branch of chemistry.

Fischeria, a genus of tropical twining shrubs, belonging to the order Asclepiadaceæ.

Fiscus, a Latin word denoting properly a wicker basket or pannier, but from the Roman custom of carrying money in such receptacles, eventually signifying a money-chest.



From the American Red Cross Abridged Text Book on First Aid.

Fractures and their Care.

bread was required to be made. Besides national offerings, each individual brought his first fruits, grain, honey, wine, and other commodities, which were perquisites of the priest, who alone might eat them.

Firth, a Scottish name for a narrow arm of the sea, usually the outlet of a river, as the Firth of Forth.

Fischart, Johann (c.1545-c.1590), German writer and satirist. Fischart not only ranks as the foremost German humorist, but as a moral teacher he is worthy of place by the side of Luther and the humanists. He was a staunch upholder of Lutheran principles, and attacked the Jesuits with violent and often coarse satire. He had enlightened views on education, demanding that it should be na-

Fish, cold-blooded, aquatic vertebrates in which the limbs are modified into fins, these paired fins, like the unpaired ones which are also present being furnished with supporting fin-rays; the first pair of gill-arches is modified into jaws and the embryo develops without any amnion or allantois. Except in Dipnoi respiration is effected solely by means of gills, the heart has only two chambers and contains nothing but venous blood and the nasal sacs have no communication with the cavity of the mouth. In the majority of fish the skin bears scales which are developed from the dermis, and at each side of the body there is a 'lateral line' of sense organs. See **ANGLING**; **FISHERIES**; **PISCICULTURE**. For a general account of fish, consult Gunther's *The Study of Fishes*,

G. B. Goode's *Fishery Industries of the United States*, and C. F. Holden's *Big Game Fishes of the United States*.

Fish, Hamilton (1808-93), American statesman, was born in New York City. In 1843-5 he was a Whig representative in Congress, in 1847 was a member of the State Senate, in 1849-51 was governor of New York, and was Secretary of State in the cabinet of President Grant, 1869-77. He was one of the Joint High Commission by which the important Treaty of Washington was negotiated, 1871, creating a basis for the arbitration of the *Alabama* claims, and providing for the settlement of the long-standing dispute with Great Britain concerning the northwestern boundary of the United States.

Fish, Nicholas (1846-1902), American diplomat, son of Hamilton Fish, was born in New York City. He was secretary of the United States legation at Berlin, United States *chargé d'affaires* at Berne, Switzerland, 1877-81, and minister resident at Brussels, 1882-6, later becoming a banker in New York.

Fisher, Dorothy Canfield (1879-), American author, was born in Lawrence, Kan. She did war work in France for three years and has been interested in educational questions and reforms. Among her published works are *Corneille and Racine in England* (1904); *The Montessori Mother* (1913); *Mothers and Children* (1914); *The Bent Twig* (1915); *Home-Fires in France* (1918); *The Brimming Cup* (1921); *Her Son's Wife* (1926); *Voluntary Education* (1927); *Why Stop Learning* (1927); *Bonfire* (1933).

Fisher, George Jackson (1825-93), American physician, was born in North Castle, N. Y. He was in charge of the surgical department of the State prison at Sing Sing, in 1853-4, served as a volunteer surgeon for the Sanitary Commission in the Civil War, and from 1853 to 1873 was U. S. examining surgeon of a brigade of the New York national guard. Among his works are: *A Brief History of the Circulation of the Blood* (1877), and *Sketches of Some of the Old Masters of Anatomy, Surgery, and Medicine* (1880-3).

Fisher, Irving (1867-), political economist, was born in Saugerties, N. Y. Tutor in mathematics at Yale University, 1890-93; assistant professor, 1893-8; professor political economy since 1898. Member Roosevelt's National Conservation Commission, 1907; Chairman Committee on Alcohol of Council of National Defense, 1917; president American

Association for Labor Legislation, 1915-17; active in various economic organizations. The most recent of his many books is *After Reformation. What?* (1933).

Fisher, Sydney George (1856-1927), American writer, was born in Philadelphia, Pa. He is best known as a writer on American history, his works including *The Making of Pennsylvania* (1896); *The Evolution of the Constitution* (1897); *The Struggle for American Independence* (1908); *American Education* (1917); *The Quaker Colonies* (1918); and many articles on out-of-door life and field sports.

Fisher, William Arms (1861-), American editor, educator and musical composer, was born in San Francisco, Cal. He has composed and published many songs, anthems, and part-songs and edited with original accompaniments a volume of *Irish Songs*, and one of *Negro Spirituals*. He is the editor-in-chief of *The Musicians' Library*, *The Music Students' Library*, and *The Music Student's Piano Course*.

Fisher, Fort, a former fort on Federal Point, near the mouth of the Cape Fear River, about 18 m. s. of Wilmington, N. C. It was important during the Civil War for the Confederate defense of Wilmington harbor, which late in 1864 was the only port along the Atlantic coast left open to Confederate blockade runners.

Fisheries, a general term describing the industry concerned with the capture and sale of fish. Like hunting, fishing has been carried on since earliest times, and evidence is abundant that primitive man was familiar with many of the devices in use to-day. The food fishes are naturally of first importance industrially, but many other aquatic animals are profitably captured either for food or for industrial uses, as the whale, which furnishes oil and whale-bone; the blackfish and porpoise, also furnishing oil; the walrus, seal, and sea-otter, yielding fur and ivory; and, lowest in the scale, the sponges, which supply an important article of commerce.

The term 'fishing grounds' is commonly applied to any area in which fishing is carried on. A fishing ground may be resorted to by fish either for food or for spawning, and this consideration often determines the times and localities of fishing. The most important fishing grounds in the world are those located in the Atlantic Ocean, off the eastern coast of North America, between Nantucket and Labrador, stretching for a distance of 1,100 geographical miles, with a varying width of 50 to 250 m.

The inshore grounds are mostly small banks,

ledges, and shoals with rocky, stony, gravelly, and sandy bottoms, separated by tracts of mud and sand. Upon the elevated parts, cod, haddock, and pollock abound; the muddy areas between constitute the best localities for hake. These grounds differ among themselves in the character of their food supply, and also in the supply of migratory fishes, especially herring, that come to them from the adjacent coves and rivers, an important element in the productiveness of any ground. The offshore grounds, known collectively as the Grand Banks, have much the same character as the inshore grounds, except that they are deeper.

region to another. Cod are abundant near shore only during the colder months, while lobsters retreat to deep water at the beginning of winter and return again in the spring. Salmon, shad, and alewives ascend the rivers in the spring, often hovering about the entrance for days until the proper temperature is reached. In recent years our knowledge of these conditions has been greatly increased by the investigations of the Bureau of Fisheries in the Department of Commerce.

The appliances used in catching fish belong to three general classes, the hook and line, the net, and the trap. Modifications of these



Photo by Ewing Galloway, N. Y.

Taking a Large Tuna Fish on the Atlantic Coast.

The bottom of these banks is covered with starfish, periwinkles, clams, crabs, shrimps, and octopus, while the water swarms with minute protozoans brought down by the Arctic currents. These minute creatures furnish food for larger forms of life which in their turn are devoured by crustaceans and different species of fish upon which the cod and other large species are nourished.

The effect of temperature is shown by the movements of the fish from the feeding grounds to the spawning grounds and especially in those fish which migrate periodically from one

devices are numberless, each locality developing some slightly different form dependent upon the materials available or local peculiarities of the ground.

The simple hook and line is most commonly modified by 'ganging'—attaching a number of short lines with hooks, known as 'snoods,' to a long line, called the 'ground line,' at intervals of three or four feet. The 'ground line' is provided with an anchor for each end, with a line running to the surface, and with a buoy to mark the position of the line. The ground line, or 'trawl,' is sometimes several miles in length

and may have as many as 10,000 hooks attached to it.

Nets are used in a great variety of forms and ways. They may be 'cast' over a great number of fish so as to enclose them, or they may be stretched along outside the fish and then drawn to the shore, thus landing the fish on the beach. This is called 'seining.' An ingenious modification of the shore 'seine,' called the 'purse' seine, is used to enclose schools of 'surface' or 'floating' fish, such as mackerel and menhaden. In use, this net, resembling a cylinder without a bottom, is paid out from a small boat so as to enclose the school of fish. The lower edge is then brought to the center by hauling on the purse line, thus converting the cylinder into a bag, from which the fish cannot escape. Drift nets or gill nets are huge bags held in place against the tide by anchored boats. They differ from other nets in that the fish is caught by the gill covers in the mesh as it tries to withdraw from the obstruction which it has encountered.

Traps, weirs, pounds, and fykes are devices into which the fish readily finds the way, but from which it cannot so easily escape. Small traps with funnel-shaped openings are in common use all over the world; though built of different materials, as bamboo, rattan, palmetto fiber, or galvanized iron wire netting, they are all used in much the same way. They are most common on coral reefs, or other rough, uneven ground. Fykes are cylindrical nets, with single or serial funnel-shaped ends, at the apex of which is the small opening for the entrance. The fixed shore trap is called a weir if made of fencing or wattled brush, or a pound if made of netting. In properly constructed pounds, only a small percentage of the fish succeed in getting out of the trap.

The pound net fishery is an important one both in view of the great quantities of fish taken and on account of the powerful influence it is supposed to exert in reducing the supply of shore-haunting species. Few forms of fishery apparatus are more effective in gathering in all kinds of fish, both large and small, whether swimming at the surface or along the bottom, than are the pound nets along the American Atlantic coast.

The most important American fisheries, including those of Canada and Newfoundland, are for cod, herring, mackerel, halibut, menhaden, salmon, and white-fish. Of British fisheries, those for herring, halibut, and mackerel yield the greatest return. In Norway the most valuable catch comprises cod, herring, salmon, sea-trout, and ling; sealing and whal-

ing are prosecuted along the northern coasts, in the Arctic Seas, and about the shores of Iceland and the Faroes; Danish fishermen take plaice, flounders, cod, eels, and garfish; those of Greenland seals, whales, salmon, and cod. The most common fish in the waters of Finland are herring, pike, bream, white-fish, smelts, and salmon—all of them brackish-water, migratory, or fresh-water fish. The most important fishery of Sweden is for herring, sprats, and young herring, which are preserved as 'anchovies.' German fisheries are prosecuted in the North Sea, chiefly for herring, cod, and mackerel. The 'great fishery' of the Netherlands is for herring; next in importance is deep-water fishing on the Dogger Bank for cod and ling.

The sea fisheries of France are divided into the high-sea fisheries off Newfoundland and Iceland, and in the North Sea for cod, herring, and mackerel, and the home or coast fisheries for oysters, sardines, turbot, plaice, skate, and a variety of other fish. The most valuable Spanish fisheries are for sardines and tunnies, which are preserved both in salt and oil. The peoples dwelling on the north shore of the Mediterranean Sea catch tunny, sardines, anchovy, swordfish, mackerel, shad, eels, sponges, and precious coral. The sponge fishery of Greece is the most extensive of its kind in the world.

The river and lake fisheries of other countries than those of North America and Russia add but little to the food supply of the people, although many of them are of value in furnishing sport and recreation. In the Great Lakes of North America fishing is carried on throughout the year, save in the warmest weather. In the Columbia River, on the Pacific slope, the salmon fishery is of great importance. They are captured by drift or gill nets, from 200 to 300 fathoms long and 6 to 7 fathoms deep. In Russia the fisheries of the Ural and Caspian are valuable, the most important species taken being sturgeon, salmon, and herring.

Turtles and terrapin are caught along the Atlantic coast south of Virginia. Oysters are gathered along the Atlantic coast from Narragansett Bay southward into the Gulf of Mexico, the principal center of the industry being Chesapeake Bay. In the Northern States, small oysters, 'seed oysters,' brought from natural beds in Chesapeake Bay, are 'bedded' on artificial beds, where they remain until they reach marketable size.

Two kinds of clams are extensively used for food. One, common north of New York, is

the long clam or soft-shell clam; the other, common about New York and southward, is the quahaug, or little neck, or hard clam. Both live in mud or sand flats, and are turned out with a fork or rake at low tide.

Among the marine invertebrates, lobsters are second only to oysters as an article of trade. They are found along the coast of New Jersey and northward to the St. Lawrence River. They are taken in traps made of lath with a funnel of netting. The blue, or edible, crab is also caught in large numbers during the summer season along the Atlantic coast by scooping with a long-handled dip net, or by baited lines without hooks.

By common law all persons have a common and general right of fishing in the sea and in other navigable and tidal waters, but this right is subject to the paramount right of navigation and to legislative restriction; it is furthermore restricted by the fact that one may not trespass on adjoining private lands above high-water mark. The exclusive right to fish in any portion of the navigable waters may be acquired by grant or legislative enactment. The right of fishing on private lands belongs generally to the owner or his tenants, as does the right of fishing in small lakes and ponds surrounded by private property. The state may and does secure the protection of its fisheries by regulations as to the time of taking fish, the method of taking, etc.

The right of subjects of different nations to fish in the sea is generally regulated by custom or by international treaty. As early as 1783, for example, the Treaty of Paris provided that American fishermen might continue to fish in British waters off the Atlantic coast.

The first prominent attempt at international regulation of fisheries on the high seas was the Anglo-French convention of 1839, applying to the English Channel and adjacent seas. A more important agreement was the North Sea Convention of 1882, to which Belgium, Denmark, France, Germany, Great Britain, and the Netherlands were parties, and which had to do strictly with the policing of the North Sea fisheries. Of special interest was the Bering Sea Arbitration of 1893, between Great Britain and the United States, since this arose out of a conflict of interests and was arrived at only after long discussion. The Submarine Cable Convention of 1884, confirmed by practically all countries, interdicts fishing in the vicinity of cables and cable ships.

The Care and Disposition of the Catch.—Fish of all kinds are best flavored when used fresh, and great advances have been made in the

methods employed to dispose of them in this condition. The simplest and oldest methods of preserving the surplus catch are drying in the open air and smoking. Vast quantities of cod, hake, haddock, and some other varieties with firm, coarse flesh, are dry-salted, owing to the fact that the salt readily penetrates into the flesh, preserving it in a softer and more tender condition than could be done by smoking.

The idea of packing small fish in oil under the name of 'sardines' seems to have originated in France, where for many years the people have been accustomed to catch and prepare small fish that would be of little value for other purposes. Other countries have not been slow to utilize large numbers of their small fish in this way, and to-day Italy, Spain, Portugal, Sweden, Norway, Japan, and the United States have developed large industries of this sort. Salmon are canned in great quantities on the Columbia River and in Alaska during the season.

Before World War II, the annual U. S. consumption of fish—fresh, frozen, smoked, and canned—averaged 1,800,000,000 pounds. In 1942 fish consumption declined for four reasons: 20% of the year's catch was bought by the Food Distribution Administration for the armed forces and for lend-lease requirements; tin containers were lacking; no fishing boats were built; thousands of fishermen were drafted or entered war industries.

To aid the fishing industry, the Federal Government established July 21, 1942 the Office of Fishery Coördination, with the Secretary of the Interior as Fishery Coördinator. With the British West Indies and other American Republics, the U. S. Government in 1942 undertook an inquiry into the fisheries of the Caribbean Sea, and recommended the expansion and development of fisheries in that area. See PISCICULTURE; SEAL FISHERIES; WHALING; SPONGE; NORTH SEA.

Fisheries Society, American, an organization founded December 20, 1870, to promote the cause of fish culture and fisheries, and for the discussion of questions of a scientific or practical character regarding fish. The society publishes *Annual Transactions*.

Fisheries, U. S. Bureau of, a bureau of the U. S. Department of Commerce, is concerned with the preservation and propagation of fish in the United States waters and the protection of the fishing industry, and carries on many varieties of research work. It publishes annual reports and issues bulletins on pertinent subjects.

Fisher's Hill, a precipitous bluff in Fred-

erick co., Va., about 2 m. s. of Strasburg. During the last campaign of the Civil War in the Shenandoah Valley, it was the scene, Sept. 22, 1864, of a battle between about 20,000 Federals under General Sheridan and about 12,000 Confederates under General Early. Sheridan attacked Early both in front and in the rear and completely defeated him.

Fisher's Island, an island at the eastern entrance of Long Island Sound, in Suffolk co., N. Y. Fort H. G. Wright, at the eastern end of the island, is headquarters of the coast defences of Long Island Sound.

Fish-hook, a barbed instrument attached to a line and used for catching fish. Specimens formed of bronze, horn, and fragments of shell have been found in many places in company with other remains of prehistoric man. Fish-hooks are now made of soft steel wire. Small hooks are usually attached with fine silk to pieces of gut. Larger hooks, and those to which artificial flies are fastened, are generally eyed, so that the gut, gimp, or line may be tied directly to the hook. The modern fish-hook is for most purposes bent to a spiral curve, the sharpest portion of which terminates in a straight, barbed point parallel to the shank.

Fishing. See **Angling**; **Fisheries**.

Fishing Creek, Battle of, a minor engagement of the American Revolution, fought, Aug. 18, 1780, on Fishing Creek, S. C., between an American force under Colonel Sumter and a British force under Colonel Tarleton. The Americans were completely surprised and were thoroughly routed.

Fish Lice, a general name for the parasitic forms of the order Copepoda, forming the division Epizoa. The name is also applied to certain of the isopods which have the same parasitic habit, and belong to the tribe of Flabellifera.

Fisk, Clinton Bowen (1828-90), American soldier and philanthropist, was born in Greggsville, N. Y. He served with the Union army in the Civil War, and subsequently interested himself in the amelioration of the condition of the colored race, and helped to organize Fisk University in Tennessee; he was for many years president of the board of Indian commissioners.

Fisk, James, Jr. (1834-72), American broker and stock speculator. He amassed considerable property during the Civil War by an astute policy in the handling of government contracts, and, it was rumored, by the no less lucrative enterprise of smuggling cotton through the lines. Subsequently he entered

the field of stock speculation in New York City. A system of wholesale bribery, established in connection with projects of the Erie Railroad, entangled courts, legislators, and Federal officials, but came to an end with an ill-advised attempt to influence even President Grant, in connection with the designs on the gold supply, and with the memorable panic of 'Black Friday' in 1869.

Fiske, Bradley Allen (1854-1942), American naval officer, inventor, author, born in Lyons, N. Y.; distinguished himself at the Battle of Manila Bay; became captain in 1907, and rear-admiral in 1911. He is best known for his successful naval inventions; the most important of which are the naval telescope sight. He was awarded a gold medal by the Franklin Institute in 1893 for his invention of the electric range finder, and the gold medal of the Aero Club in 1919 for his invention of the torpedo plane. He published *Electricity in Theory and Practice* (1884, 10 eds.); *The Navy as a Fighting Machine* (1916); *From Midshipman to Rear-Admiral* (autobiography, 1919).

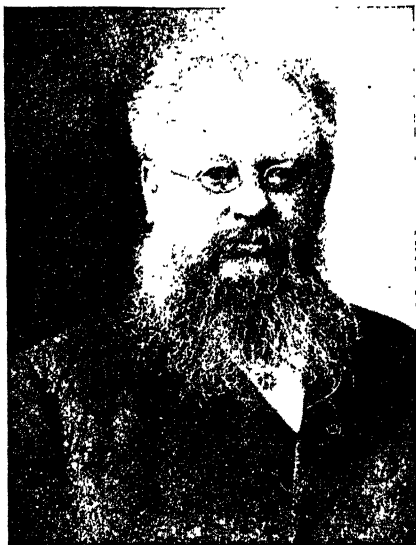
Fiske, Rt. Rev. Charles (1868-1942), bishop, was born in New Brunswick, N. J. After serving parishes in New Jersey, Pennsylvania, and Maryland, he was consecrated Bishop Coadjutor in 1915 and Bishop of Central New York in 1928. Among his works are *The Faith By Which We Live* and *The Confessions of a Puzzled Parson*.

Fiske, Daniel Willard (1831-1904), American scholar and educator, was born in Ellensburg, N. Y. From 1849 to 1852 he was associated with the Astor Library in New York, gathering its collection of Icelandic books. He bequeathed to Cornell his fine library, including notable collections of works on Dante, Petrarch, and on Icelandic literature, with an endowment for its maintenance. He published several works on chess and edited the *American Chess Monthly* (1857-60).

Fiske, John (1842-1901), American philosopher and historian, was born in Hartford, Conn. He was lecturer on philosophy at Harvard in 1869, instructor in history there in 1870, and assistant librarian from 1872 to 1879. He delivered numerous public lectures, chiefly on American history, to large audiences throughout the country.

In addition to his *Cosmic Philosophy*, his principal contribution to philosophic literature, his publications include: *The Unseen World, and Other Essays* (1876); *Darwinism and Other Essays* (1879); *American Political Ideals* (1885); *Critical Period of American History, 1783-89* (1888); *The Dutch and Quaker Colonies*

in *America* (1899); *Through Nature to God* (1899); and *New France and New England* (1902). Consult Perry's *John Fiske*.



John Fiske.

Fiske, Minnie Maddern (1865-1932), American actress, was born in New Orleans, La. Under the tuition of her mother, she became proficient as an actress at a very early age, performing in children's parts almost continuously from her fourth year. In 1890 she was married to Harrison Grey Fiske, and passed several years in retirement, engaged in dramatic study. Her three most notable creations, after her reappearance, were the title characters of *Tess of the d'Urbervilles* (1897), *Becky Sharp* (1899), and *Leah Kleschna* (1905).

Fiske, Stephen (1840-1916), American journalist and author, was born in New Brunswick, N. J. He was war correspondent for the *New York Herald* during a part of the Civil War. He managed theaters in London and New York, and later became dramatic critic of the *Spirit of the Times*. Mr. Fiske wrote several plays and published *English Photographs and Offhand Portraits of Prominent New Yorkers* (1884).

Fisk University, a co-educational institution situated in Nashville, Tenn., for the education of the colored people of the South. It was founded in 1866 under the auspices of the American Missionary Association and the Western Freedmen's Aid Commission. The organization comprises preparatory, college,

theological, normal, and music departments.

Fismes, town, France, in the department of the Marne; p. about 3,000. In the Great War Fismes was occupied by the Germans, and was used by them as an important depot of supplies. In the course of the Second Battle of the Marne it was entered by American troops on August 4, 1918. After seven hours of bitter fighting the German forces were routed by a terrific artillery bombardment and driven back twelve miles.

Fistula, a term used in surgery for an abnormal channel between a hollow viscus and the surface of the body, or between two hollow viscera. Common examples are *salivary fistula*, opening into a salivary duct; *genito-urinary fistula*, opening into some portion of the genito-urinary tract; *entero-vesical fistula*, between the intestines and the bladder; *vesico-vaginal fistula*, between the bladder and the vagina. *Fistulæ* usually arise from an abscess, which, being neglected, bursts in more than one direction.

Fistulariæ, a family of marine fishes, remarkable for the elongation of the front bones of the head into a pipe, bearing the small mouth at its apex.

Fistulina, a genus of edible fungi, of which one species, the Beefsteak or Liver Fungus, is common. This is a large, liver-like fungus usually found growing on old chestnut and oak trees.

Fit, a term popularly applied to any seizure in which convulsions occur. Fits occur in such diverse conditions as epilepsy, hysteria, apoplexy, and uræmia.

Fitch, the fur of the Fitchew or Polecat.

Fitch, John (1743-98), American inventor of an engine for the propulsion of a boat against the streams of rivers. The *Perseverance* was launched on the Delaware River in 1787 and achieved the rate of progress of three miles an hour. It was improved later and its power so increased that it made 80 miles in one day. A company for the navigation of the Delaware proved a failure, and having vainly visited France in 1793 in the attempt to promote his invention Fitch returned to the United States in a destitute condition. Disheartened by his misfortunes, he committed suicide.

Fitch, William Clyde (1865-1909), American dramatist, was born in New York City. Beginning with *Beau Brummel* (1890) he composed a succession of plays, which include *The Moth and the Flame*, *Nathan Hale*, *Barbara Frietchie*, *The Climbers*, *The Last of the Dandies*, and *The Truth*.

Fitchburg, city, Massachusetts, one of the

county seats of Worcester co. Fitchburg is a thriving industrial city, having manufactures of motor trucks, castings, lumber products, edge tools, fire-arms, machinery, textiles, paper products, shoes, and bicycles; p. 41, 824.

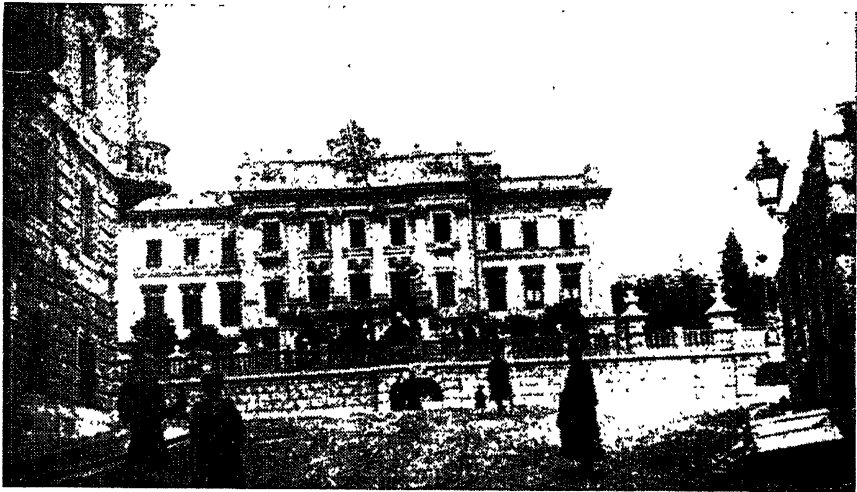
Fitz, the Anglo-French word for son, of which the earlier form was *filz*. In early historical use Fitz was prefixed to the name of a parent; and the compound thus used has passed into a common surname, as Fitzpatrick.

Fitzgerald, Edward (1809-83), English poet and translator. The first forty-two years of his life passed in quiet reading and study, and it was not till 1851 that he published anonymously his dialogue on youth, *Euphra-*

(1920) and *Flappers and Philosophers* (1920) soon after his return from army service in France. His stories revealed the disillusioned young generation of the post-war period and had a marked effect on the popular literature of the decade 1920-30. Other books include *The Beautiful and the Damned* (1921) and *The Great Gatsby* (1925).

Fitzgerald, Percy Hetherington (1834-1925), Irish novelist, was born in Fane Valley, County Louth, Ireland. His works include several histories in addition to many novels.

Fitzpatrick, Sir Charles (1853-1941), Canadian jurist, was appointed crown prosecutor for Quebec in 1879. He was a member of the



Government Palace at Fiume.

nor, which was followed by *Polonius*, 1852. Fitzgerald's interest in Persian literature dates from about 1853. Sa'di's *Gulistan* early attracted him by its quaint stories, and in 1856 he published an anonymous version of Jami's *Salāmān and Absāl*. The Persian poet who most interested him, however, from the time of his first seeing his works in 1856 in a MS. in the Bodleian Library, was Omar Khayyam. His translation of the Rubaiyat, published anonymously in 1859, at first attracted little attention, but the later realization of its value led to the publication of four more editions before the translator's death. Fitzgerald's letters, his works, and his *Letters to Fanny Kemble* were edited by Aldis Wright. Consult also *Life* by T. Wright.

Fitzgerald, F. Scott (Francis Scott Key) (1896-1940), American novelist, achieved immediate success with *This Side of Paradise*

Quebec Assembly in 1890-6 as a Liberal, was elected to the Dominion Parliament in 1896, and was solicitor-general, 1896-1902. In 1901 he was appointed Minister of Justice, in 1906 chief justice of Canada, and in 1908 one of the British members of the International Arbitration Court at The Hague.

Fitzpatrick, John Bernard (1812-66), American Roman Catholic bishop, was ordained at Boston in 1840. He erected a fine orphan asylum, a reformatory, a hospital, and a college. A controversy with the Boston school board in 1854 ended in a repeal of rules obnoxious to the pupils of his church. His administration aroused marked hostility.

Fitzroy, Robert (1805-65), English admiral, hydrographer, and meteorologist, was born in Suffolk. In 1828 he was put in command of the *Beagle*, employed in surveying the Southern Coast of South America. On this

voyage he was accompanied by Darwin, the two together publishing in 1839 a *Narrative of the Surveying Voyages of H.M.S. 'Adventure' and 'Beagle,'* vols. i. and ii. by Fitzroy, and vol. iii. by Darwin. From 1843 to 1845 Fitzroy was governor of New Zealand. The 'Fitzroy barometer' was his invention; and he also instituted the system of storm warnings that has grown into the daily weather forecasts. Among his works are *Meteorological Observations* (1839); *Weatherbook* (1863); *Remarks on New Zealand* (1846).

Fitzroya, a genus of small, evergreen, hardy, and half-hardy coniferous trees.

Fitzwilliam Museum, a museum at Cambridge, England, founded by Richard, Viscount Fitzwilliam, an Irish peer, who left his picture gallery, library, engravings, and £100,000, to the university. The collection is specially rich in sculptures and antiques, and is housed in a fine Greek building.

Fiume, Adriatic port, capital of the Italian Provincia del Carnaro, on the north of the Gulf of Quarnero. 35 m. s.e. of Trieste. It consists of an old and a new town; the old containing the Cathedral of the Assumption, 1377, and a Roman triumphal arch erected in the 3d century. Fiume's geographical position makes it an important commercial center; it has a harbor with a lighthouse and several break-waters, which have been greatly improved in recent years. Paper, torpedoes, tobacco, and chemicals are manufactured, and there are also rice mills and petroleum refineries. Fisheries are of importance. Area, 271 sq. m.; p. 101,988.

Fiume originally belonged to the Byzantine Empire. It was under the control of Austria from 1471 to 1822, when it was ceded to Hungary. In 1848 it was annexed to the crown lands of Croatia, but passed back to Hungary in 1870. At the close of the Great War the city was a bone of contention between Italy and the newly organized Yugoslav state. The latter claimed it as an economic necessity as her only means of access to the sea, while Italy insisted that the town was essentially Italian and that its possession was necessary to her safety in the face of a potential enemy. Yugoslavia blocked Italian acquisition from 1918 to 1919, when the poet militarist, D'Annunzio, at the head of a band of volunteers and Italian regulars seized it. The Italian government ousted D'Annunzio in 1920.

By the treaty of Rapallo, concluded in November, 1920, both Italy and Yugoslavia recognized the independence of Fiume. D'Annunzio, dissatisfied with the frontiers assigned by the

treaty, refused to recognize its terms, but after some disorder was forced to leave the city.

The treaty, however, failed to give real satisfaction in any quarter. The aspirations of the Italians and of the Yugoslavs were alike unsatisfied, while the difficulties of maintaining a separate state made it unpopular with the Fiumians. One of the chief difficulties was in the disposal of Porto Barros, an important unit in the Fiume port system, which was said to have been promised to Yugoslavia by a secret clause in the treaty. Affairs were further complicated by the overthrow of the Fiume provisional government early in 1922 by the Fascisti. Italian troops were dispatched to the city to maintain order, and military rule was continued until the conclusion by Italy and Yugoslavia of the treaty of Santa Margherita on Jan. 27, 1924. The treaty provided for the annexation of Fiume and its harbor to Italy, while Porto Barros went to Yugoslavia, both ports to be administered jointly by the two countries. An Italo-Hungarian convention providing for a Free Zone at Fiume for the benefit of Hungary was signed in Rome on July 25, 1927.

Five Forks, Battle of, a battle fought on April 1, 1865, at Five Forks, Va., about 11 m. s.w. of Petersburg, between a Federal force of about 25,000 under General Sheridan and an inferior Confederate force, belonging to Lee's army, under General Pickett. The battle was hotly contested, the Confederates fighting bravely against heavy odds, but being finally defeated and forced back to Sutherland Station. Strategically the battle was of great importance, since it settled the fate of Petersburg, which was evacuated by the Confederates on April 3.

Five Hundred, Council of. See **Council of Five Hundred**.

Fixed Bodies, a term applied in chemistry to those substances which remain fixed, and are not volatilized at moderately high temperatures.

Fixed Oils, those oils which, on the application of heat, do not volatilize without decomposition.

Fixtures. Personal property affixed or annexed to real estate in such a manner and under such circumstances as legally to become a part of it. The substance of this definition is accepted by the general weight of authority, but some cases adhere to the opposite idea, holding that the term is properly applied to chattels affixed to real estate, which may lawfully be taken away by the tenant upon leaving or the owner upon sale. It is practically

impossible, under the authorities, to lay down exact rules by which to determine with certainty whether an article attached to the realty has become a fixture or not, and where there is no precedent in a particular case, the only sure way is to litigate the question.

In general, it may safely be said that a chattel will become a fixture after it has been attached to real estate, and become appurtenant to it to the extent of being necessary or especially adapted to the convenient use of the whole or any portion of it, and with the intention of having it remain there permanently.

In the United States, barns, granaries, etc., erected by an agricultural tenant for his own use, have been held to come under the rule of exception. Exceptions have also been made in favor of particular articles, the character of which would be hard to determine in absence of precedents. For example, *gas fixtures* may be removed by a tenant who has affixed them, or an owner who has sold his house. The law favors grantees and mortgagees as against grantors and mortgagors in doubtful cases, and heirs as against executors.

The precedents in the jurisdiction in which a case arises must be examined, as opposite decisions in regard to certain chattels obtain in different jurisdictions. For example, the cars and locomotives of a railroad company are fixtures in some States, and movable chattels in others. See LANDLORD AND TENANT; PERSONAL PROPERTY; REAL PROPERTY. Consult Ewell's *Treatise on the Law of Fixtures* (new ed. 1905).

Flabellifera, a name applied to a tribe of isopods, in which the body ends in a tail fan, made by the last pair of appendages and the telson.

Flabellum. 1. The fan used in the ecclesiastical service of the Roman Catholic and Greek Churches. 2. A genus of solitary corals of the order Madreporaria. 3. The name of certain appendages in some Arthropods.

Flag, a design, usually in colors, symbolizing authority or ownership, made of flexible material, as cloth, so as to wave in the air, and generally attached to a pole that is fixed, or to a staff that may be carried. Its origin goes back to remote antiquity, and may be traced to the whip and its lash, symbolizing the authority of a leader over men; hence its use in war. As a military ensign the flag was probably developed out of the fixed standard of the Romans and other ancient nations, through the transitional forms of the vexillum and labarum, in both of which a square piece of cloth

was fastened to a cross bar at the end of a spear.

One of the earliest known forms was the gonfalon or gonfalon, which was carried by the magistrates of mediæval Italian cities, and by those taking up arms in behalf of the Church. Other older forms of flag are the following:

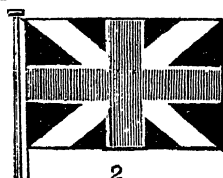
The pennon was an ensign of knightly rank, exhibiting in earlier ages some decorative design, and, after the introduction of heraldry, sometimes the badge, sometimes the arms of its owner. The banner, rectangular in form, was borne by a king, prince, duke, or any other noble down to a knight-banneret.

Prior to the War of the Revolution the flag generally used in the American colonies was, of course, that of Great Britain. During the early part of the Revolutionary period each colony used an emblem of its own—frequently the colonial coat of arms, with the addition of some motto. On Jan. 2, 1776, a new flag was raised at Cambridge, where the American army was then assembled. This flag retained the Union Jack to indicate that the colonists still recognized their allegiance to Great Britain and in addition had, as a field, thirteen stripes, alternate red and white, to represent the thirteen colonies.

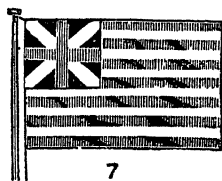
Finally on June 14, 1777, the Continental Congress adopted a flag, having, as before, a field of thirteen stripes, but substituting for the Union Jack a union of thirteen stars on a blue ground, 'representing a new constellation.' The anniversary of this day is celebrated in all the States of the Union as *Flag Day*. According to tradition, the first flag after the new design was made by Betsy Ross in Philadelphia.

No change was made in the national flag until January, 1794, when two new States, Vermont and Kentucky, having been admitted to the Union, Congress increased the number of both stars and stripes by two. The next change was made in 1818, when five new States, Tennessee, Ohio, Louisiana, Indiana, and Mississippi, having been admitted, Congress restored the thirteen original horizontal stripes, increased the number of stars to twenty, and provided that on the admission of every new State one star be added to the union of the flag, the addition taking effect on the Fourth of July succeeding such admission. This law still remains in force—the last two stars, added in 1912 for Arizona and New Mexico, bringing the present number to forty-eight.

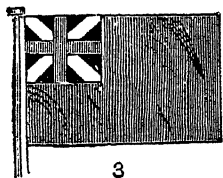
In the U. S. Army the flags range from the



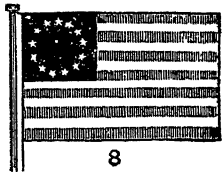
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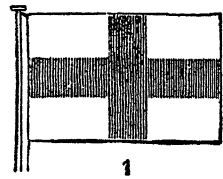
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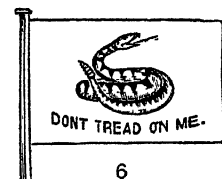
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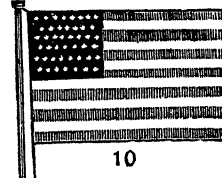
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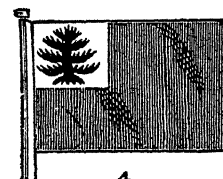
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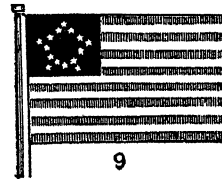
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American Flags, Colonial and National.

1. Red Cross flag of Great Britain, Ensign of Henry VII., planted on North American soil by Sebastian Cabot in 1497. 2. Flag of Great Britain, and of the Colonies from 1620 to June 14, 1777, showing the red cross of St. George and the white cross of St. Andrew on a blue field. 3. Flag formed by changing the color of the British flag to crimson and placing the two crosses in the upper corner, adopted in 1707. 4. Colonial modification of flag of 1707, one of the flags of Massachusetts colony. 5. Pine Tree Flag, also of Massachusetts colony, adopted for American vessels in 1775. 6. Flag of the southern colonies, 1776-7. 7. First striped flag, known as the 'Cambridge Flag' and in Great Britain as the 'Rebellious Stripes,' raised at Washington's headquarters, Cambridge, Jan. 2, 1776. 8. First flag of thirteen stars and stripes, adopted by Continental Congress, June 14, 1777. 9. Flag as changed in 1794 by addition of two stripes and two stars for Vermont and Kentucky—flag of the War of 1812. 10. Flag authorized by Act of Congress, April 4, 1818, with thirteen stripes and one star for each State.

large national ensign flown at the post or garrison flagstaff to the silk colors and guidons carried by the troops. The design and construction of these are prescribed by Army Regulations, as also are those of the President, the Secretary of War, and the Assistant Secretary. The President's flag is blue, with the official coat of arms of the United States.

In the U. S. Navy the national flag, called the 'ensign' or the 'colors,' is carried at the spanker gaff, or on a flagstaff at the stern. In addition to the national ensigns, a man-of-war has on board several union jacks, the man-of-war flag of every maritime nation, and a large number of distinguishing and signal flags. The union jack—or the 'jack,' as it is commonly called—is simply the blue field and stars of the national ensign. In fine weather, when a vessel is at anchor, the jack is hoisted on the jackstaff at the stem of the ship. The flags of foreign nations are used for purposes of ceremony connected with salutes or courtesies to foreign nations or dignitaries. The personal distinguishing flags are used to indicate the presence on board of an official of rank. A white triangular pennant with a blue Latin cross is the navy call to church. A white or yellow flag indicates the presence of a contagious disease or quarantine. The white flag with the red cross of the Geneva Convention is flown over hospitals, ambulances, hospital ships, and other places made neutral by the terms of that Convention.

There are numerous flags, in addition to those of Army and Navy officials, that are used to designate official position or authority.

Other Countries.—The national flag of Great Britain is the Union Jack—more properly called the 'Great Union'—established by royal proclamation of April 12, 1606. It was formed by a combination of the crosses of St. George and St. Andrew; and at the union with Ireland, in 1801, the cross of St. Patrick was added. The Union flag, pure and simple, is essentially the military flag of England. It is also used as a ship-of-war's jack, and as such is flown on the jackstaff forward; as a flag of command in the navy it is the flag of an admiral of the fleet, who flies it at the main truck. The White Ensign is the peculiar flag of the royal navy; the Blue Ensign is the distinctive ensign of the Royal Naval Reserve; and the Red Ensign is the flag of the British merchant service.

The Merchant Flag of Canada bears the Canadian coat of arms in appropriate colors on the right side of the red field of the British merchant flag; that of Australia consists of six stars of unequal size distributed irregularly on

the blue field, significant of the six original states of the Commonwealth; and the flag of New Zealand shows four five-pointed stars on the red field of the British ensign.

The national flag of the German republican Reich is now a tricolor of three horizontal stripes—black, red and yellow. The French flag is the 'Tricolor'—blue, white, and red in vertical bars, the blue being next the staff. The flag of the Soviet Government in Russia is the red flag charged, in the upper quarter of the hoist, with a golden sickle crossed saltirewise with a golden hammer, a star above. The national flag of Austria was red, white, and red in three horizontal bars. The naval flag of Italy is of green, white, and red in vertical bars, bearing the arms of Savoy in the center, with a royal crown above. The flag of the Spanish navy is of three horizontal stripes—a yellow between two red. The yellow one bears an escutcheon with the arms of Leon and Castile, surmounted by a royal crown. The Portuguese flag is part green, part red, with, in the center, the arms of Portugal. The Norwegian flag is red, with a blue cross bordered with white; the Swedish flag is blue, with a yellow cross. The Danish flag is red with a white cross. Both the naval and the merchant flag of the Netherlands are striped horizontally, red, white, and blue. The Belgian flag is striped vertically, black, yellow, and red. The flag of the Greek navy has nine horizontal stripes, alternately blue and white, the upper quarter next the staff being blue, with a white cross, in whose center is a crown. The naval flag of Turkey is red, charged with a decrescent moon and an eight-pointed star, both white. The Japanese naval flag represents the rising sun—a red central disc, with alternate red and white spreading rays. The Chinese republic flies a flag of red with a blue field in the upper hoist bearing a white ball surrounded by 16 triangular rays. The Mexican flag is a tricolor of green, white, and red, bearing the Mexican arms on the white stripe when flown as a naval ensign, and plain when flown on merchant vessels.

The majority of the flags of the South American republics are simple tricolors for the merchant marine, and tricolors displaying the national arms for the navy. The naval flag of the Argentine Republic is horizontally striped blue, white, and blue, bearing an emblazoned sun on the white stripe. The same flag without the sun is used by the merchant marine. The flag of Brazil is green, with a central disc of blue on a yellow diamond. The disc shows eighteen stars in white, and the motto *Ordem*

e Progress. The flag of Chile consists of two horizontal bars, the lower one red, the outer two-thirds of the upper one white, the third next the staff blue, with a single white star. The flag of Peru is red, white, and red, in vertical stripes, with the national arms on the central stripe for the naval flag, and plain for merchant vessels.

The use of flags as distinctive emblems is on the increase. Nearly every State of the United States has now its special flag, and many of the cities have theirs. Colleges display their colors in the form of a flag, usually charged with some symbolic design, as the college seal; and the various college fraternities and patriotic organizations have also their special flags.

There is no Federal law in force pertaining to the manner of displaying or saluting the United States flag, except that providing that no trademark can be registered which consists of the flag or any simulation thereof.

It is the practice in the Army, each day in the year, to hoist the flag briskly at sunrise, and to lower it slowly and ceremoniously at sunset, and to display it at half staff on Memorial Day from sunrise until noon and at full staff from noon until sunset, the flag always being hoisted to the top of the staff before being lowered to the half staff position. The Army Regulations provide also that when officers and enlisted men in civilian dress pass the national flag, not encased, they will uncover, holding the headdress opposite the left shoulder with the right hand; if uncovered they will salute with the right hand salute.

The following suggestions as to displaying the flag are offered by the Adjutant General's Office: that as far as possible the hanging of the flag should be restricted to suspending it from a flag pole, in the regular way; that if it is the desire to use the flag for decorative purposes it should always be hung flat with the union to the north or east; that it should rarely be displayed in a horizontal position or laid flat; that under no circumstances should it be hung where it can easily be contaminated or soiled; that no object or emblem of any kind should be placed above or upon it. Consult Hulme's *Flags of the World*; Preble's *The American Flag*; Stewart's *The Stars and Stripes*, *A History of the United States Flag* (1915).

Flag, a popular name for many monocotyledonous plants with sword-shaped leaves, mostly growing in moist situations.

Flag Day. See **Flag**.

Flagellants, a name applied to certain religious fraternities practising self-flagellation.

The first of these originated at Perugia in 1260, later offshoots made their appearance in Bavaria, Austria, Moravia, Bohemia, Poland, and France. In the second outbreak of Flagellantism, about 1349, men and women indiscriminately appeared in public half naked, and ostentatiously underwent these self-inflicted scourings. The immediate occasion of this outburst was the plague known as the Black Death.

The Flagellants protested against clerical domination, and repudiated many of the dogmas of the Church. Consult W. M. Cooper's *Flagellation and the Flagellants*.

Flagellata, or **Flagellidia**, an order of Protozoa characterized by the presence of flagellæ, or whip-like structures, which by their movements propel the organisms through the water.

Flagellation, a form of ecclesiastical punishment, in use in religious communities since the 5th century. The Roman Catholic Church sanctions this form of chastisement, under certain conditions, as an aid to self-discipline and piety.

Flagellum, a vibratile filament of living matter associated with a cell, whether that be an isolated unit as in most flagellate Infusorians, or an element in a multicellular organism, as in the flagellate chambers of a sponge.

Flageolet, a wind musical instrument made of wood. It is a form of the ancient *flûte à bec*, or straight whistle, and in method of tone production and construction greatly resembles the ordinary tin whistle.

Flagg, Ernest (1857), American architect, was born in Brooklyn, N. Y. He was the architect of St. Luke's Hospital and the Singer Building, New York City; the Corcoran Gallery of Art, Washington, D. C.; and the United States Naval Academy at Annapolis.

Flagg, George Whiting (1816-97), American painter. He resided in London for three years, but eventually settled in New York City. His works are chiefly historical, among which may be mentioned: *Landing of the Atlantic Cable*; *Washington Receiving His Mother's Blessing*; *The Good Samaritan*; *Columbus and the Egg*; *Haidee*.

Flagg, James Montgomery (1877), American author and artist, was born in Pelham Manor, N. Y. His work includes portraits in water color and oil, and a great number of illustrations in pen and ink, crayon, and charcoal. He was appointed official military artist of New York State upon America's entrance into the Great War and has executed numerous striking war posters. He wrote and illustrated *Tomfoolery* (1904); *If: A Guide to Bad*

Manners (1905) and is the author of various moving picture scenarios.

Flagler, Henry Morrison (1830-1913) American capitalist. He did much for the development of the resources of Florida, where he founded towns, brought large areas under cultivation, and improved the steamboat and railroad facilities of the State.

Flag Officer, a naval officer of the line or executive branch, whose rank entitles him when at sea to fly a flag or broad pennant, instead of the narrow pennant of a captain or junior commanding officer.

Flag of Truce, a white flag displayed by opposing war forces to indicate that a conference is desired. It is despatched from one commanding officer to the other, and its bearers are ordinarily safe from detention or attack, unless they are suspected of being spies.

Flagship, the ship in a fleet which bears the admiral's flag, forming a sort of center to which all other vessels look for orders. It is usually the most powerful vessel in the fleet.

Flagstad, Kirsten, soprano. Born in Hamar, Norway, and received nearly all her musical training there. She made her debut with the Metropolitan Opera Company, 1935, as Sieglinde in Wagner's 'Die Walkuere.' Critics said at the time that no singer of the last ten years had made such an impression as this one had. Her favorite role is that of Isolde.

Flagstaff, town, Arizona. It is the seat of the Northern Arizona Normal School, and the Lowell Observatory is located to the northwest; p. 5,080.

Flagstone, a rock which splits into thin, flat slabs or flags in the original planes of stratification. Flagstones are generally sandstones combined with argillaceous or calcareous matter; some, however, are indurated clays, and others thin-bedded limestones. They are used for sidewalks, cisterns, etc.

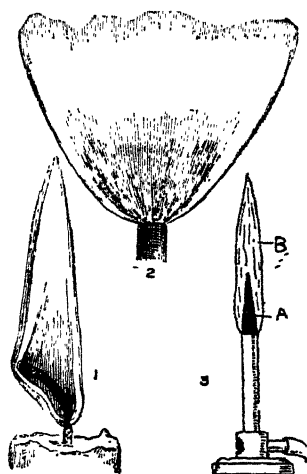
Flahault de la Billarderie, Auguste Charles Joseph, Comte de (1785-1870), French soldier and diplomat, was born in Paris. He distinguished himself in the Peninsular War and the Russian campaign, and in 1813 received the title of count, and the rank of general of division. He was ambassador at Rome, Vienna, and London (1842-62).

Flail, an instrument for threshing grain, once generally used throughout Northern Europe, and still occasionally employed there and in the United States. The implement consists of two strong sticks, the *hand staff* and the *swipple* or *souple*, which are bound together by leathern thongs. See **THRESHING**.

Flamborough Head, a promontory of the Yorkshire coast, England. On the Head is a lighthouse, 214 ft. above sea level, and 80 ft. high, seen 21 m. off.

Flamboyant, a period in French Gothic architecture; also termed Third Pointed. Examples occur early in the 15th century, and continue until the middle of the 16th, when exuberant richness in decoration was the fashion. It expressed itself in sculpture, color, tracery, and design; much of the later work being brilliant and rich, although less dignified than previous or contemporary styles. The name is derived from the flamelike waved lines in which the tracery of the heads of windows, panels, etc., was designed.

Flame. When heat is evolved in chemical combination at a sufficient rate, the uniting bodies and their products may be made hot enough to shine. In most cases when this happens, the temperature reached is sufficient to



Flame.

1, Candle. 2, Gas. 3, Bunsen: A, unburnt gas + 62 per cent of air; B, burning gas mixed with air.

vaporize the united bodies, and the gases produced, or already present, diffuse into each other, so that the union takes place over a considerable area. This area of heated gases is called a flame.

As flames are generally produced by the union of one gas with another that surrounds it, they, as a rule, take the shape of hollow cones, the interior being filled with one unburnt gas and the exterior surrounded by the other. Flames differ very much in appearance.

according to the gases uniting. Thus, hydrogen burning in air is almost colorless and non-luminous; carbon monoxide burns with a blue, and cyanogen with a pink flame, both giving but little light; while hydrocarbons, phosphine, etc., burn with more or less luminosity.

Flames give light for several reasons, one of the simplest being the presence in the flame of incandescent solid matter. Thus, in the incandescent gas lamp and in the limelight, solids are purposely put into an otherwise non-luminous flame; while in candle, illuminating gas, and oil flames, solid particles of carbon are the chief cause of the luminosity, being set free by the decomposition of the hydrocarbons present.

In other cases high temperature and considerable density of the flame gases, which may be produced by pressure, increase or cause luminosity. The converse is also true: cooling and lowering the pressure on a flame are marked by a reduction in its light-giving power.

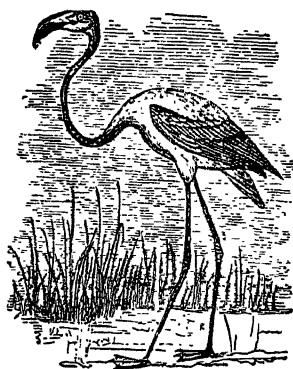
If the flame of coal gas or hydrogen issuing from a blow-pipe nozzle be slowly passed up a wide glass tube, it will be found that at a particular position up the tube the flame is rapidly extinguished and rekindled, while at the same time it gives forth a peculiar musical note. This is known as a *singing flame*. The sound is caused by longitudinal vibrations of the air in the tube.

Flame Flower, popular name given to various plants belonging to the genus *Kniphofia* or *Tritoma* (Liliaceæ). These are hardy or half-hardy tufted plants, with long, narrow, sword-shaped, radical leaves, and tall scapes, often five feet high, surmounted by brilliant, densely packed floral spikes, of drooping, tubular flowers.

Flameng, Leopold (1831-1911), French engraver and etcher, was born in Brussels. He produced many fine illustrations, and was especially gifted in his interpretation of artists. Among his well-known plates are those after Gainsborough's *Miss Graham* and the *Blue Boy*; Rembrandt's *The Hundred Florin Piece*; Laurens' *The Death of Sainte Geneviève*. He also illustrated the *Decameron*, *Gil Blas*, *Don Quixote*, and many other works.

Flamens, were priests in ancient Rome devoted each to some special deity. There were fifteen in all. The chief of these were the flamen of Jupiter, of Mars, and of Quirinus, who were always patricians; the remaining twelve were chosen from the plebeians. The flamen of Jupiter was not required to take an oath, was attended by a lictor, his house was an asylum, and he had a seat in the Senate.

Flamingo, a bird structurally intermediate between ducks and geese on the one hand, and storks and herons on the other. The special peculiarity of the flamingo lies in the structure of the bill, which is large and abruptly bent down at the middle point. The upper jaw is broad, flattened, and freely movable; the lower, deep, channelled, and almost immovable. The legs are exceedingly long, as is also the neck, and the plumage is always pinkish or scarlet. The birds wade in the water, stirring up the bottom with restless feet, and grub for small animals.



Flamingo.

The flamingoes are birds of powerful flight, and fly like geese in strings or wedge-shaped flocks. The genus includes eight or nine species, four of which are American (in Chile, Galapagos, Mexico, West Indies), while the others are distributed in Africa, Southern Europe, India, and Ceylon.

Flaminian Way, the great road from Rome to the north of Italy. It owed its name to the democrat C. Flaminius, who was censor in 220 B.C. It was the first road to cross Italy from sea to sea.

Flaminius, Titus Quintius (c. 228-c. 174 B.C.), was consul in ancient Rome in 198 B.C., and defeated Philip v. of Macedon in the decisive battle of Cynoscephalæ (197 B.C.), which led to peace.

Flaminius, Caius, a Roman statesman of the popular party. He was responsible for the Flaminian circus and road, which ran northwards from Narnia to Ariminum.

Flammarion, Camille (1842-1925), French astronomer. In *Voyages en Ballon* he described his balloon ascents (1868), and published in 1889 a scientific romance entitled *Urania* (Eng. trans. 1891). Of permanent value are his *Catalogue des Etoiles Doubles* (1878), *Les*

Etoiles et les Curiosités du Ciel (1881), and *La Planete Mars* (1892). To the general public Flammarion is best known as a brilliant popularizer of astronomical subjects.

Flamsteed, John (1646-1719), English astronomer-royal. His observations were posthumously edited by his assistant, Joseph Cros-thwait, in 1725, in the three volumes of the *Historia Caelestis Britannica*, the third containing the *British Catalogue* of 2,935 stars.

Flanders (Flem. *Vlaenderen*), the country of the Flemings, long an autonomous countship of Europe, sometimes partly under the suzerainty of France, and sometimes partly under the suzerainty of the empire, but in point of fact generally independent and self-governing. For the most part it embraced the region fronting the North Sea from the northern arm of the Scheldt to the Somme in France. From the middle of the 11th century down to 1477 the countship of Hainault was almost continuously united with it. Since the 1st century, this region has been distinguished for its industrial towns, remarkable for their large populations and powerful democratic rule. Industrially and politically these cities, especially Ghent, Bruges, Ypres, Courtrai, Roulers, Valenciennes, Tournai, Lille, and others, were most famous from the middle of the 10th century to the middle of the 16th century, when Spanish rule became supreme, and to a great extent extinguished their prosperity. The district around Bruges and Sluys was in the 7th century called *municipium Flandrense*; this was the nucleus of the future countship of Flanders, which was not created until 862, and was at first a fief of the crown of France. The woolen industry, the foundation of the industrial power of the Flemish cities, was introduced into the country in the middle of the 10th century. From the early years of the 13th century down to the year 1477, the most prominent feature in the political history of Flanders was the persistent endeavor made by the French kings to obtain a preponderating influence in the country. At various periods between 1659 and 1713 the French succeeded in gaining the several districts which are now described as French Flanders; while the rest of the countship eventually fell into the power of the French republican armies in 1794, and at the treaty of Vienna (1815) was incorporated in the new kingdom of the Netherlands. And its last political transference was made in 1830, when the core of the ancient countship was assigned to the kingdom of Belgium.

The Flemings are, broadly speaking, de-

scended from Frankish tribes, who settled in this part of Europe in the 4th and succeeding centuries, but modified by strong strains of Belgic and Saxon blood. Their language may be briefly described as southern Dutch. It has a considerable literature, already dealt with under **BELGIUM**, *Literature*. See Kervyn van Lettenhove's *Histoire de Flandre* (5th ed. 1898), and Pirenne's *Geschichte Belgiens* (1899-1902). The term is now applied to two Belgian provinces: East Flanders and West Flanders.

Flandin, Pierre-Etienne (1889-), French politician who became Premier in the critical late 1934 period when his country was still in the throes of the Stavisky scandal and faced the world battle of the currencies, a rearming Germany and rising unemployment. Flandin sought to re-establish the authority of the Government, badly shaken by the street disturbances of the preceding February, but resigned in 1935; minister of Foreign Affairs, 1940.

Flandrin, Hippolyte (1809-64), French painter, born at Lyons. After winning the Prix de Rome with *The Recognition of Theseus* (1832), he became the fashion, and was much employed in the decoration of public buildings.

Flange, in mechanical engineering, a projecting flat rim or collar, used to strengthen the object of which it forms a part, to provide a suitable means of attachment to another object, or, acting as a guide, to assist in maintaining their correct relative positions. The wheels of railway carriages or street cars are kept to the track by vertical flanges.

Flannel, a variety of soft, woolen textile. Flannels are made of woolen yarn, slightly twisted in the spinning, and of open texture, the object being to have the material soft and spongy, without regard to strength.

Flash Point is the temperature to which an oil must be heated to give off vapor that will catch fire if ignited. The temperature at which this occurs, depends very much on the apparatus employed, being far higher in an open vessel than in a closed one. As there are legal restrictions in most countries as to the storage, etc., of oils of low flash points, the apparatus to be employed is specified.

Flat in music is the name given to the sign which signifies that the note before which it is placed is to be lowered a semi-tone. Two of these signs, are termed a *double flat*, and indicate that the note they prefix must be lowered two semitones.

Flatfish means the members of the family Pleuronectidæ, in which the body is flattened from side to side, instead of from above down-

wards, as in skate and ray. This family embraces the turbot, sole, plaice, flounder, and halibut.

Flat Foot, or **Pes Planus**, an acquired deformity associated especially with youth, weak general health, and over-pressure upon the feet. It is commonest in young people whose daily work entails long hours of standing. When the patient stands barefooted, the arch is seen to be breaking down and the foot is flattened out on the inner side.

Flatheads, an Indian tribe, residing in the vicinity of Flathead Lake, Montana. In language they are of Salish stock.

Flatulence, a term used in medicine for distention of the stomach or intestine by flatus or gas. It is generally due to faulty digestion, but sometimes to mechanical obstruction, and occasionally to the chemical action of drugs which produce effervescence.

Flaubert, Gustave (1821-80), French novelist, was born in Rouen. His first work, *Madame Bovary*, his greatest novel, appeared in the *Revue de Paris* in 1857. It served to secure for him the friendship of Gautier and his set, the Goncourts, Gavarni the artist, and others. In 1862, Flaubert published the historical romance *Salammbô*; in 1869 *L'Education Sentimentale*, a realistic novel; in 1874 *La Tentation de St. Antoine*, a historical romance; in 1887 *Trois Contes*, three short stories, of which the first is modern, the other two are historical.

The root-idea of Flaubert's work seems to be that things external to the writer have in some Platonic region of ideas their perfect form of expression. The greatest writer, consequently, is he who makes himself the subtlest instrument for receiving impressions from these outward things, and rendering such impressions in the perfect—because aptest—literary language.

All of his novels have been translated into English. His *Œuvres Complètes* appeared in eight volumes. Consult *Lives*, in French, by Faguet, P. Bourget.

Flavia gens, the Flavian clan of ancient Rome, famous as that of the emperors Vespasian, Titus, and Domitian.

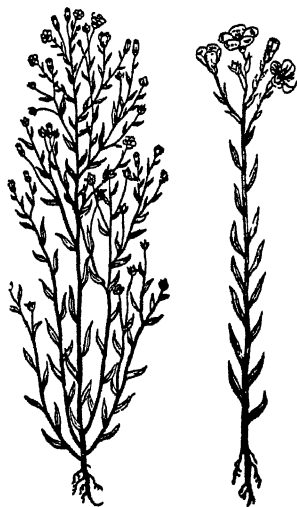
Flavine, a concentrated preparation of quercitron bark. Formerly an important yellow dye, it has been largely replaced by cheaper coloring materials.

Flavorings are substances of characteristic taste and odor used in cooking, to render dishes more agreeable to the palate.

Flax, the typical genus of *Linacæ*, a sub-order of the *Geraniacæ*, including more than

one hundred species of annual and perennial herbaceous plants, with a few small shrubs, all inhabitants of temperate climates. The most important of these is the Common Lint or Flax, cultivated since ancient times for its fiber, which is spun into linen, and for its seed. See LINSEED.

The Common Flax is an annual herbaceous plant; the stalk—the source of the fiber—is erect, 2 or 3 ft. in height, and branched only near the top; the leaves are narrow and lance-like; and the flowers, which are borne in corymbs, are bright blue in color, with five petals and five sepals. The sepals are persistent, but the petals fall early. The fruit is a round boll divided into a number of cells in which are the smooth heavy seeds—the linseed of commerce.



Flax.

a, Seed flax; b, Fibre flax.

There are two distinct varieties of flax grown—one primarily for seed, and the other for fiber. Seed flax is grown very largely as a breaking crop on the prairies of the Western United States. Consult *Flax for Seed and Fibre*, and *Fibre Flax* (*Farmer's Bulletins No. 27 and 669*, U. S. Department of Agriculture); Dodge's *Dictionary of the Fibre Plants of the World*; also references under LINEN.

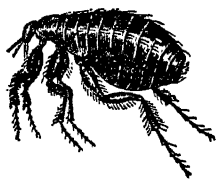
Flax, New Zealand, a liliaceous plant bearing tough, radical leaves usually about four feet in length. The plant yields a valuable fiber, which is stripped by machinery, and used for making baskets, ropes, etc.

Flaxman, John (1755-1826). English sculptor. was born at York. From 1775 till 1787 his chief source of income was the Messrs. Wedgwood, whom he furnished with exquisite designs and decorations for their pottery, work for which he was admirably fitted by his skill in modeling in relief.

He was in Italy from 1787 to 1794, and there executed his celebrated outline illustrations to Homer, Æschylus, and Dante. His groups of *Cephalus and Aurora*, *Michael and Satan*, his *Psyche*, and his *Shield of Achilles* are among some of his best-known productions; others are his monuments to Nelson, Howe, and Reynolds, in St. Paul's Cathedral, and numerous exquisite bas-reliefs, scriptural in subject, at Buckingham Palace. His work had a powerful influence on his younger contemporaries. See Sidney Colvin's *Drawings of Flaxman, with Life* (1876).

Fleabane, the name of a plant of which the genus *Erigeron* is common to the United States and the genus *Pulicaria* is common to England. It is a perennial plant often to be found growing in damp ground. It is usually found in masses, the plant commonly growing to a height of about twenty inches. The pungent aromatic odor from the plant is supposed to ward off fleas and other insects. The plant has also been used medicinally.

Fleas are insects which are to be regarded as flies modified for a parasitic life. They have no wings, the mouth parts are adapted for piercing and sucking, the legs, especially the last pair, are long, strong, and fitted for jump-



Common Flea (much enlarged).

ing; the larva is minute and worm-like, and has the mouth parts adapted for biting. Many species of fleas are known, not a few birds and mammals having their own characteristic forms. The adults apparently feed only on blood, but, as in the case of some other blood-sucking insects, they can exist for a prolonged period under conditions where it is difficult to believe that this diet can be available. For the formidable giant American flea, see CHIGOE.

Fliche, La, town, department Sarthe,

France. Its military school for officers' sons occupies the site of a 16th-century Jesuit school, in which Descartes, the philosopher, was educated; p. 10,519.

Fleet Prison, situated on the east side of Farringdon Street, London, dated from Norman times, but little is known of its early history. Here were confined Lord Surrey, the poet; Bishop Hooper, the martyr; Prynne, who lost his ears for *Histriomastix*; Wycherley, the poet; Savage, the poet, and friend of Johnson; and Penn, afterwards of Pennsylvania. Irregular marriages, or those without a license, were performed by a priest in this prison, and were held to be legally binding, the system being perfectly organized early in the 17th century.

Fleetwood, market town and port, Lancashire, England. The town is named after Sir P. H. Fleetwood, who since 1836 has converted a rabbit warren into an active fishing port and health resort; p. 20,000.

Fleming, John (1785-1857), Scottish naturalist, the first zoologist of his time in Scotland, he wrote *The Philosophy of Zoology* (1822), wherein he criticised the classification of Cuvier and discussed the characters of animals.

Fleming, John Ambrose (1849-1945), Eng. electrical engineer, born at Lancaster. When the Edison Electric Lighting Company was formed, he was appointed their electrical engineer, and superintended the introduction of incandescent lighting into England. The erection of the present engineering and electrical laboratory at University College, London, was due to him, and he is now regarded as one of the first living experts on electrical matters. He invented the thermionic valve, revolutionizing wireless telegraphy, and was associated with the development of wireless telephony and other inventions. The most recent of his many scientific works is *The Interaction of Scientific Research and Electrical Engineering* (1927). He has published *Short Lectures to Electrical Artisans* (2d ed. 1885); *The Alternate Current Transformer* (new ed. 1903); *Electric Lamps and Electric Lighting* (2d ed. 1899); *Magnets and Electric Currents* (1898); *Handbook for Electrical Laboratory* (1901-3); *Waves and Ripples in Water, Air, and Ether* (1902).

Fleming, Sir Sandford (1827-1915), Canadian engineer, born at Kirkcaldy, Fifeshire. He was one of the engineers who first made surveys for a Canadian transcontinental railway, and took an active part in the promotion of a state cable between Canada and Australia, opened in 1902. He was president of the Royal

Society of Canada, 1888-9. He represented Canada at the International Prime-meridian Congress at Washington, D. C., in 1884. His publications include *The Inter-colonial: A History*, 1832-76 (1876); *England and Canada* (1884); *The Unit Measure of Time* (1890); *Memoirs on Universal Time and a Prime Meridian for all Nations* (1881); *The New Time Reckoning* (1889).

Flemings. See **Flanders.**

Flemington and Kensington, suburb of Melbourne, Victoria, Australia, has one of the finest racecourses in the world; p. 10,947.

Flemish Language and Literature. See **Belgium.**

Fletcher, Alice Cunningham (1845-1923), American ethnologist, born in Boston, Mass. With the coöperation of the Woman's National Indian Association, Miss Fletcher originated the system of enabling Indians to obtain land and erect houses with the aid of small loans. On several occasions she was appointed special U. S. agent for the allotment of land to the Indians; and she was sent to Alaska and the Aleutian Islands by the U. S. Commissioner of Education to examine the conditions of the Indians in those districts. Besides her important contributions to scientific publications, she wrote *Indian Story and Song from North America* (1900), the material for which she personally obtained among the Indians of the West, and which contains some of the most important notations of Indian music yet secured.

Fletcher, Andrew, of Saltoun (1655-1716), Scottish politician, born at Saltoun, East Lothian. After 1703 he took a prominent part in politics, his aim being to preserve as far as possible the independent authority of Scotland in matters affecting its own interests. He was also one of the chief projectors of the disastrous Darien colonization scheme, and likewise the advocate of a variety of ingenious methods for promoting the internal prosperity of the country. The union with England had in him one of its most strenuous opponents. He died in London. He was the author of *Two Discourses Concerning the Affairs of Scotland* (1698); *Speeches* (1703), etc. *A Life* (1897), by G. W. T. Omond, is included in the Famous Scots Series.

Fletcher, Benjamin, colonial governor of New York from 1692 to 1698. The dates of his birth and death are unknown. He befriended the Indians against the French, and by them was called 'Great White Arrow'; but he found it difficult to unite his own people in defence of the frontier. He was opposed

and condemned by political and religious factions and accused of protecting Kidd and other pirates to his own profit. Besides protecting piracy, he was charged with accepting bribes, and interfering with elections both by force and corruption. He built Trinity Church on 'King's Farm,' where the present building of that name now stands.

Fletcher, Giles (1588-1623), English poet, was born in London. His poetry was written in early life, under the influence of Spenser, and in its turn influenced Milton. Poems: *Christ's Victory and Triumph*.

Fletcher, Horace (1849-1919), American author and lecturer, was born in Lawrence, Mass. After 1895 he devoted special attention to sociology with relation to scientific nutrition and research in the chemico-physiological laboratories at Cambridge, England, and Yale University. Among his publications are: *Menticulture* (1897); *Happiness* (1900); *Nature's Food Filter; or, What and When to Swallow* (1901); *Glutton or Epicure* (1902).

Fletcher, John (1579-1625), English dramatist, was born at Rye, Sussex. His collaboration as a dramatist with Francis Beaumont (1584-1616) began about 1607. The two are said to have lived together on the Bankside in Southwark in the closest literary and personal relations. After Beaumont's death Fletcher continued to write for the stage, often with Massinger and other playwrights. Fletcher was considered more brilliant, more gay, but less noble than Beaumont; his forte was comedy or romance, Fletcher's particular part in very many plays of the time is still a matter of research and controversy. Discrimination between the work of the two dramatists Beaumont and Fletcher has been the object of serious study resulting in some general conclusions about their more important works.

Works assigned to Beaumont and Fletcher include: *Philaster* (Fletcher being given three scenes, disputed); *The Knight of the Burning Pestle*; *The Coxcomb* and *Cupid's Revenge*—these with possible other collaborators.

Works assigned to Fletcher alone include: *The Faithful Shepherdess*; *The Triumph of Death*; *The Woman's Prize or the Tamer Tam'd*; *Wit without Money*; *The Island Princess*; *Rule a Wife and Have a Wife*. Fletcher and Ben Jonson are said to have collaborated on *Love's Pilgrimage*, with, possibly Massinger; Fletcher and Shakespeare on *Two Noble Kinsmen* and *Henry VIII*. Consult E. K. Chambers's *The Elizabethan Stage*; *Works* edited by Alexander Dyce.

Fletcher, Julia Constance (1858-1938),

American novelist and dramatist. pen-name George Fleming, daughter of the Rev. James C. Fletcher. She wrote *Kismet* (1877), *Mirage* (1878), *The Head of Medusa* (1880), *Vestigia* (1882), *Andromeda* (1883), *The Truth about Clement Kerr* (1889). Among her plays are *Mrs Lessingham*, *A Man and his Wife*, *The Canary*, *The Light that Failed*.

Fletcher, Robert (1823-1912), American anthropologist, born in Bristol, England. He was professor of medical jurisprudence in Columbian University, president of the Anthropological Society of Washington, and editor of *Index Medicus*. He published *Human Proportion in Art and Anthropometry* (1883); *The New School of Criminal Anthropology* (1891); *Scopelism* (1897).

Fleur-de-lis, in heraldry, a conventionalized lily, or, as some think, iris. It is most famous as the emblem of the kings of France, who bore a blue shield, powdered with golden fleurs-de-lis. Charles VI. reduced the number to three, at which it has since remained. The fleurs-de-lis occur frequently in British heraldry.



Fleur-de-lis.

Fleurus, market town, Belgium, province Hainaut, on the Sambre; 15 m. w. of Namur. Here, on Aug. 29, 1622, the Spaniards were defeated by Duke Christian of Brunswick; on June 30, 1690, the Dutch and the Germans under Prince Waldeck were defeated by the French under Luxembourg; on June 26, 1794, the French under Jourdan gained a victory over the Austrians under the Prince of Saxe-Coburg. It has coal mines; p. 7,171.

Fleury, Flory, or Flowery, in heraldry signifies that the object thus described is adorned with fleur-de-lis.

Fleury, André Hercule De (1653-1743), French statesman and cardinal, was born in Lodève, in Languedoc. In 1715 he was appointed tutor to Louis xv., and acquired an influence over the King's mind which was always powerful. Upon the death of the regent he was made cardinal and in this position held the reins of French affairs. For seventeen years he gave France an orderly and peaceful rule, allowing the country to recover from the extravagances of Louis xiv., and putting forth every effort for peace and a good understand-

ing with England. In 1733, however, he was forced, much against his will, into the War of the Polish Succession, which resulted in the addition of Lorraine to France. Consult Verlacque's *Histoire du Cardinal Fleury*.

Fleury, Claude (1640-1723), French ecclesiastical historian, was born in Paris. In 1691 he began his great work, the *Histoire Ecclésiastique*, on which he labored for the rest of his life. It was published in 20 vols., between 1691 and 1720, and was continued by C. Fabre (1726-40), and A. Lacroix (1776-87). It is marked by great learning, and by a judiciously critical spirit.

Flexner, Abraham (1866-), American educator, brother of Simon Flexner, was born in Louisville, Ky. He was associated as expert with the Carnegie Foundation for the Advancement of Teaching, New York, from 1908 to 1912; and in the latter year became secretary of the General Education Board. From 1930 to 1939 he was director of the Institute for Advanced Study. His published works include: *The American College* (1909); *Medical Education in the United States and Canada* (1910); *Medical Education a Comparative Study* (1925); *Universities—American, English, German* (1930); *I Remember* (1940).

Flexner, Simon (1863-), American pathologist, brother of Abraham Flexner, was born in Louisville, Ky. He has been director of the laboratories of the Rockefeller Institute for Medical Research, New York since 1903. He discovered an anti-meningitic serum for the treatment of spinal meningitis, and did valuable work in tropical dysentery, bubonic plague, and snake venom. In 1913 he announced the discovery of the ultra-microscopic organism causing infantile paralysis. In 1914 he was president of the Association of American Physicians, and in 1919 president of the Congress of American Physicians and Surgeons and of the American Association for the Advancement of Science.

Flexure, a term used in building to denote the bending of loaded beams.

Flicker, the popular name of a large group of birds of the woodpecker family, found throughout North and South America and in Cuba. See WOODPECKER.

Fliedner, Theodor (1800-64), German philanthropist, was born in Epstein. In 1836 he founded at Kaiserswerth the first German Protestant institute for the instruction of deaconesses, an event which marked the beginning of modern nurses' training. See NURSING.

Flies, an order of insects, the general char-

acters of which are discussed under the heading **DIPTERA**.

Flight, in animals. See **Flying Animals**; **Birds**.

Flight, Mechanical. See **Aeronautics**; **Gliders**.

Flinders, Matthew (1774-1814), English hydrographer and discoverer, was born in Donington, Lincolnshire. He is credited with having first suggested the name Australia for the island continent. In 1801, in the *Investigator*, he circumnavigated Australia, and charted the Gulf of Carpentaria. On his way home in 1803 he was wrecked on Wreck Reef, about 800 m. from Port Jackson. Reaching Mauritius, he was seized by the French governor and held a prisoner until 1810. He spent the last four years of his life in preparing his monumental *Voyage to Terra Australis* (1814).

Flindersia, a genus of tropical and subtropical evergreen trees found chiefly in Australia. They are tall trees of rapid growth and some species are of commercial value on account of the hardness and close texture of their woods.

Flinders Land, the early name of South Australia.

Flint, a variety of quartz, occurring primarily in irregular, nodular, concretionary masses scattered through white chalk formations. The flints, when broken open, may show silicified shells of various fossils; and there is much evidence to establish the fact that the material has been deposited from solution, and has replaced the calcareous matter of the chalk and of the shells of Echinodermata, Mollusca, and Foraminifera which the chalk contained.

Flint, when freshly broken, is dark gray, almost black, and is translucent only on the edges of thin splinters. It weathers slowly, with the formation of a white crust, part of the material being dissolved away, leaving a porous outer layer. In composition, it is practically pure silica. See **SILICON**.

At present the principal use is in the manufacture of fine earthenware. For this purpose it is first calcined, then thrown into cold water, and afterward powdered. In former times flint was used in the manufacture of gun flints, and for making fire when struck with a piece of steel. In prehistoric times it was the rough material universally adopted for stone weapons, where it could be obtained. See **FLINT IMPLEMENTS**.

Flint, city, Michigan, county seat of Genesee co. It is known chiefly as an automobile manufacturing center; p. 151,275.

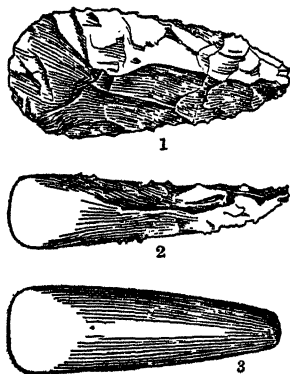
Flint, town, Flintshire, Wales. The castle of Edward I., now in ruins, was the scene of Richard II.'s betrayal to Bolingbroke (Aug. 19, 1399); p. 6,320.

Flint, Austin (1812-86), American physician, was born in Petersham, Mass. He studied at Amherst, was graduated from the medical department of Harvard (1833). From 1861 until his death he was an attending physician at the Bellevue Hospital, New York City, and professor of the principles and practice of medicine in the Bellevue Medical College. He was president of the N. Y. Academy of Medicine from 1872 to 1885.

Flint, Austin (1836-1915), American physician, son of Austin Flint, he was one of the founders of the Bellevue Hospital Medical College. In 1874-8 he was surgeon-general of New York State. He made important discoveries concerning the functions of the liver; and in his later years he was alienist for the State in many noted cases. He published a number of important works on physiology.

Flint Glass. See **Glass**.

Flint Implements, tools fashioned by the hand of primitive man. In Europe they are classified under two heads—the palæolithic, and the neolithic.



Flint Implements

1. Rough. 2. Edge polished. 3. Polished.

Belonging to the first period are the implements found in the river drift. The earliest discovery of such remote implements was made in 1847, by M. Boucher de Perthes, at Abbéville. The implements of the river drift are flakes, ridged, flat, or polygonal; trimmed flakes; pointed tools; and implements with sharp rims. In the second group of palæolithic implements are classed those from the caves. The principal tools found in use during this

period are knives, axes, and scrapers, frequently in association with harpoons and other implements of bone.

Neolithic flint implements comprise three varieties: merely chipped specimens; those ground at the edge only; and specimens beautifully polished and shaped. Chisels and gouges are found, and in endless variety of size, form, and finish; saws, sometimes sickle-shaped: scrapers, used in dressing hides; borers and awls; trimmed flakes; knives and fabricators; arrowheads and spearheads. In Egypt, Flinders Petrie has found remarkably finished specimens, worked with the ripple-flaking supposed to be characteristic of the Danish flint daggers, under conditions that seem to warrant his consigning them to a period as early as the fourth dynasty.

Flint implements have been found on the Kent plateau and elsewhere which are referred to earlier geologic time than the Palæolithic age, and to which the general name *coliths* has been given. Since 1909 large numbers of beak-shaped and other implements (including some generally similar to the so-called *coliths* of Kent) have been discovered at the base of the Red Crag marine deposits of Suffolk. Consult Evans' *Ancient Stone Implements of Great Britain*; Wright's *Man and the Glacial Period*.

Flintlock. See **Guns**.

Flitter-mouse, a common name for a species of bat. See **BAT**.

Floating Battery, an armored vessel carrying heavy guns, but with light draught and feeble motive power, or none at all; built to defend outlying channels, reduce otherwise inaccessible forts, cover landing operations, and other like purposes. The American *Monitor* was a floating battery.

Floating Islands, masses of vegetation which have been severed from the sides of a river or lake, or raised by gases from the bottom to the surface. They are not uncommon when rivers are in flood, and may so accumulate as to block the normal river course. In the Mississippi River they are often formidable.

Floatstone, a light, porous form of quartz, which sometimes will float on water. It is mostly white, and occurs in nodular or concretionary masses.

Flodden, Battle of (Flodden Field), a battle on Sept. 9, 1513, between James IV. of Scotland and an English army under the Earl of Surrey.

Flogging. See **Whipping**.

Floire et Blanchefleur, an early French

romance, of which there exist two 12th century editions. Indications are not lacking that it is of Byzantine origin. Another form of the story, much altered in transmission, is the better known *Lucassin et Nicolette*.

Flood, The (Biblical). See **Deluge**.

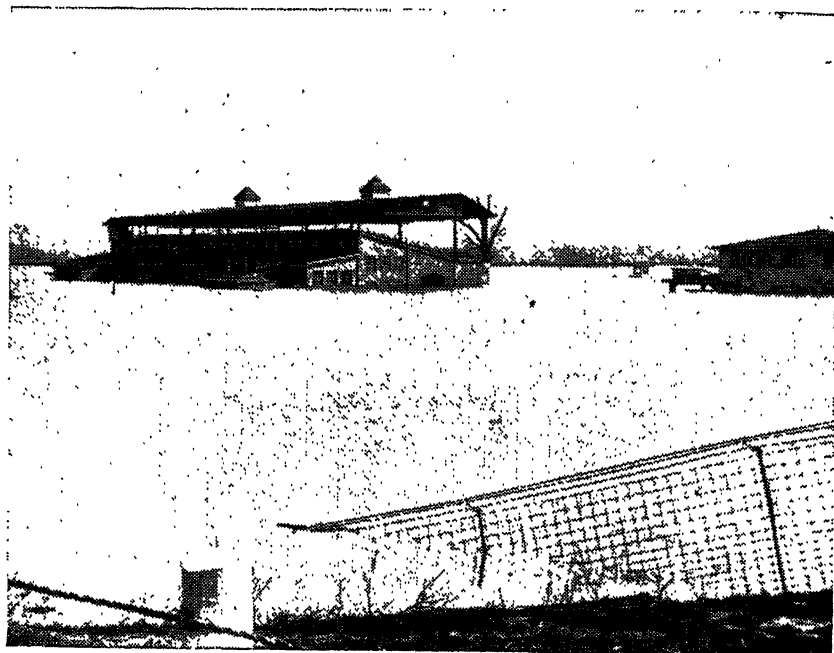
Flood Control. The great floods of 1927 in the Mississippi Valley and in New England strongly emphasized the need for more extensive and systematic measures for flood control than had up to then been attempted. They also showed the great lack of meteorological and engineering data for planning flood control works, specifically reliable long-term records of rainfall and of the resulting runoff in relation to the channels provided by nature and modified by man for carrying the rainfall to its ultimate destination, the ocean, or to large bodies of inland fresh waters like the Great Lakes. The flood control problem exists in greater or less degree throughout not only the United States but the whole world. Nor is it confined to rivers that more or less frequently overflow their banks. It includes inundations of coastal cities or plains from the ocean by high tides, or high landward winds, or the two combined, or the still further combination of tides and winds driving water on to the land from the ocean and of fresh-water floods striving to find their way to the sea. This triple combination flooded a part of London by the overflow of the Thames on Jan. 6, 1928. At Leningrad, Russia, for some 200 years plans have been under consideration to protect the city from periodic sea-water inundations. The flood of Sept. 23, 1924, which covered practically the entire city, with an area of 50 sq. m. and a population of nearly 1,000,000, to a depth of from 5 to 7 ft., drew renewed attention to the necessity for systematic works of prevention. As a rule, dams to prevent ocean inundation are out of the question, the main reliance where such inundations demand works against them being upon the construction of sea walls, as provided at Galveston, Tex., since the great inundation of Sept. 8, 1900, caused by a West Indian hurricane.

The chief means of flood control are to provide greater channel capacity when that is deficient or to prolong the time taken for the runoff to reach the river; in other words, decrease the rate of runoff so that it will not exceed the channel capacity. Where nature is undisturbed by man, as is still relatively the case in uninhabited or sparsely inhabited regions, flood relief as far as channel capacity is concerned is obtained by the stream overflowing its banks and using adjacent territory as

storage space, sometimes hundreds of acres or thousands of square miles. The first recorded Mississippi River flood, as reported by Vega in 'La Florida del Inca,' an account of the De Soto Expedition from Florida westward, was in March and April, 1543, taking 40 days to reach its maximum height. Artificial storage or detention reservoirs are an important possibility in the flood control of some streams, but the enlargement of the carrying capacity of stream channels is far more common than the provision of detention reservoirs. The channel capacity is most commonly increased by building levees, usually

The Mississippi River floods of 1927, caused by heavy rainfall over a large area, exceeded the highest previous flood which occurred in 1913. Under date of Dec. 1, 1927, Major Gen. Edgar Jadwin, Chief of Engineers, United States Army, submitted to the Secretary of War a plan for future flood control measures based on intensive studies by a large corps of engineers.

Under the proposed new plan, the present levee system would be retained for main dependence, but the levees would be raised at some points and set back at others and their cross-section enlarged for greater safety. It



Flood Scene.

of earth, because this can be obtained in the vicinity and placed at much less expense than masonry. Channels may be straightened so as to increase the rate of flow through them; islands may be removed and in extreme cases bridge piers taken out and abutments set back and longer bridge spans provided to eliminate 'bottle necks.'

A multiplicity of considerations must be taken into account in connection with flood protection works, including as many conflicting interests. These may extend beyond local to inter-community, to interstate, and even to international relations.

may well be noted here that during the 1927 floods there was practically no break in any part of the levee system that had been carried to its full intended height. On May 15, 1928, President Coolidge signed the Jones-Reid Bill, providing for flood relief and carrying an appropriation of \$325,000,000.

The flood control works for the protection of Dayton, Hamilton, and seven other communities and intervening areas along a stretch of the Miami River more than 100 m. in length, built after the disastrous flood of 1913, consist of five large detention reservoirs and river channel improvements.

Flood control problems in the Lower Colorado River in the Far West, combined with a desire to utilize the waters of the stream for power and for irrigation, have led to the building of a dam across the river near the point of its emergence from the canyon. In 1936, after disastrous floods in New England, Pennsylvania, New York, West Virginia and Maryland, President Roosevelt formed a flood emergency committee to investigate the causes of the floods and means for their prevention. Through the Flood Control Act of 1936, the Government established a definite flood control policy for the country. In 1938

a stream. Rivers that occasionally overflow their banks drop their load of sediment at such times on the valley surface. If this process is of frequent occurrence the result is to aggrade the valley, building up a bordering plain that is known as the flood plain. See MISSISSIPPI RIVER.

Floods, the abnormal rising of waters due to sea waves accompanying earthquakes, storm waves raised by cyclones, the bursting of reservoirs, the gradual rise of lake surfaces, and the giving way of ice dams, earth embankments, and glacier lakes; but by far the most common factor is an excessive rain-



Florence: The Loggia dei Lanzi with Cellini's Famous Statue of Perseus.

Congress appropriated \$375,000,000 for a five-year plan to control both river pollution and floods.

In January and February, 1937, the Ohio River and tributaries inundated vast sectors of Ohio, Kentucky and other states; making homeless nearly 600,000 persons and causing property damage totaling almost half a billion dollars. President Roosevelt thereupon asked Congress to provide for gradual reforestation of the eroded areas in preference to dam-control, which many authorities considered impracticable. See BOULDER DAM and Floods.

Flood Plain, a level land area bordering

fall, which causes rivers to overflow their banks, inundating the surrounding country. Earthquake floods are frequently associated with great loss of life. Notable examples of this class were the waves that swallowed up Sikokf Island, Japan (684), and those that accompanied the great earthquake at Lisbon (Nov. 1, 1755). Almost as disastrous was the great rush of sea waves over the land caused by the eruption on Aug. 26, 1883, of Krakatoa.

Waves accompanying cyclones are sometimes very disastrous, the one associated with the Backergunge cyclone, in the delta of the Ganges, reaching a height of forty feet, and

destroying more than 100,000 persons. The devastation at Galveston, Tex., in 1900 was also caused by a storm wave of this origin. Reservoir floods through the bursting of dams are usually disastrous, notable cases being those that caused the loss of 2,500 lives at Johnstown, Pa., on June 1, 1889, and of 76 lives at Austin, Pa., on Sept. 30, 1911.

The most tremendous floods are produced by a river changing its course—as, for instance, the Yellow River in China. During historical times the place where this river discharges into the sea has varied through a distance of 350 m. The loss of life at each change has been enormous—amounting to between forty and fifty millions of lives from 1851 to 1866.

The great flood of 1658 in the river Somme, in France, was due to the combination of melting snow with heavy rainfall; and similar conditions prevailed in 1910, when the Seine flood overwhelmed Paris. The annual flood damage in the United States has been estimated at more than \$235,000,000.

One of the most devastating floods in United States history began in January, 1937. Owing to abnormal winter rain in the valleys of the Ohio and Mississippi, the regions along these rivers were visited by unparalleled high water, which inundated Cincinnati, Louisville, and many smaller cities along the Ohio River. It threatened to destroy Cairo, Ill., at the confluence of the Ohio and Mississippi, but a floodway at New Madrid, Mo., was dynamited to relieve the pressure, and a 60-foot concrete sea wall surmounted by a 3-foot bulkhead held firm as the crest of the flood moved down the Mississippi.

The \$270,000,000 levee and spillway system built since the 1927 floods was strengthened at weak spots by a large army of workmen as far as New Orleans.

By February 15, 1937, the estimated number of dead was 400; the property loss almost half a billion dollars; and the persons made homeless nearly 600,000. Quick aid was rendered by the Red Cross, which raised \$20,000,000 for relief; the Federal Government, through the Disaster Loan Corporation, which was created as an emergency measure by act of Congress; the Coast Guard, the Resettlement Administration, and other governmental agencies.

Flora, the ancient Roman goddess of flowers, whose festival was held annually in the spring from April 28 to May 3. In 238 B.C. a temple was erected to her in the Circus Maximus in Rome.

Flora, a term used to indicate the totality of plant species in a circumscribed area. It may also serve to indicate the totality of plant species at a given epoch in time. See BOTANY; PLANTS.

Florence (Italian *Firenze*), city, Italy, capital of the province of Florence. The city, originally on the right bank of the river, was extended to the left bank in the Middle Ages. Since the demolition of the ancient walls in 1865, it has spread extensively, especially toward the north and east, and since 1888 the former narrow and unsanitary quarters which constituted the heart of the city, and the site of the Ghetto, have been entirely modernized.

The chief architectural feature is the Cathedral in the Piazza del Duomo, one of the largest churches in Italy, erected chiefly between 1296 and 1436. Its interior is adorned with several fine pieces of sculpture by Michelangelo, Ghiberti, Sansovino, Della Robbia, and others, and with two bronze doors. Its detached Campanile, Giotto's greatest work, was built between 1334 and 1387, and is 276 ft. high. Near the west end of the Cathedral stands the Baptistery, which served as the cathedral of the city down to 1128. It has still more famous bronze doors, three in number, the work of Ghiberti and Andrea Pisano. Among the other famous churches are those of Santa Croce (1294-1442), the Pantheon of Florence; Santa Maria Novella (1278-1350); Santa Maria del Carmine; San Lorenzo; the New Sacristy, built in 1523-9 by Michelangelo to serve as the mausoleum of the Medici, also belongs to this church; the Church of the Annunciation (1250), decorated with frescoes by Andrea del Sarto; the Church of the Trinity, with frescoes by Ghirlandajo; of the Holy Spirit (15th century); of Or San Michele, with Orcagna's famous tabernacle; the Monastery of St. Mark, decorated with Fra Angelico's frescoes; and the fine Romanesque Church of San Miniato, outside the city.

These edifices testify to the prominence of Florence in the world of art, a position which is still further enhanced by the glorious canvases and sculptures of the Academy of Fine Arts; by the treasures of the Uffizi Palace (1560), one of the most valuable collections of painting and sculpture in the world; and the even more valuable collection of the Pitti Gallery (1440). Other notable buildings of the city are the castle-like Palazzo Vecchio (1298-1314), the seat of the city's government until 1532, now the Town Hall; the cloistered hall of Dei Lanzi (1376), with Benvenuto Cellini's *Perseus*, and other masterpieces of sculpture

(it was in this square Savonarola was burned in 1498); the Uffizi Palace (1560-74), containing the National Library, a picture gallery, the central archives of Tuscany, and the post office; the archaeological museum, which contains notable Etruscan collections; the national museum of the Middle Ages and the Renaissance, sheltered in the Bargello (13th century), the ancient chief law court of the republic.

Florence ranks as the intellectual capital of Italy, a position it owes not only to the natural gifts of its inhabitants, but also to the memory of its greatest citizen, Dante, and to the fact of its being the seat of the (national) Accademia della Crusca, and the vigorous Institute for Advanced Studies, which virtually fulfils the offices of a university.

Florence was made a Roman 'colonia' under Sulla but not until the time of Charlemagne did she rise out of obscurity. After the death of the Countess Matilda, 1115, she began first to assert her independence and during many years there was strife between two warring factions, the Guelphs and the Ghibellines. The Black Death swept Florence in 1348, destroying 100,000 inhabitants. From 1434 the family of the Medici asserted their power and under Lorenzo de' Medici Florence was the center of the Renaissance. Savonarola belonged to the last decade of the 15th century. In 1530 the city became the capital of the grand-duchy of Tuscany. In 1859 she was united to the kingdom of Italy and from 1865 until the conquest of Rome in 1870 served as the capital of the kingdom.

Among the most distinguished natives of Florence are Dante, Boccaccio, Cimabue, the Gaddis, the Lippis, Della Robbia, Donatello, Machiavelli, Ghirlandajo, Orcagna, Andrea del Sarto, Ghiberti, Benvenuto Cellini, Lully, Cherubini, Amerigo Vespucci, and Guicciardini. In the English cemetery are buried Mrs. Browning, Landor, Clough, and Theodore Parker; p. 355,000.

Bibliography.—Hutton's *Literary Landmarks of Florence*; Oliphant's *Makers of Florence*; Horsburgh's *Lorenzo the Magnificent and Florence in Her Golden Age* (1908); Vernon's *In and Out of Florence* (1910); Lucas' *A Wanderer in Florence* (1912); Allen's *Florence* (1912); Lacy's *With Dante in Modern Florence* (1912); Grierson's *Things Seen in Florence* (1922); Roth's *The Last Florentine Republic* (1925); Brenton's *The Golden Age of the Medici* (1925).

Florence, city, Alabama. It is the seat of the State Normal College and the Burrill

Normal School for negroes. A few miles above are the Muscle Shoals. The military road constructed by Andrew Jackson runs through the city, and is one of its important streets; p. 15,043.

Florence of Worcester (d. 1118), old English chronicler and monk who spent nearly the whole of his life in the monastery of Worcester. His *Chronicon* begins from earliest times, and comes down to 1107. Prior to his own age his work is simply a compilation from the *Anglo-Saxon Chronicle*, Bede, and other historians, but from 1082 to 1107 he writes of contemporary events and from that date until 1111 his work was continued by his brethren in the monastery.

Flores, department, Uruguay. The capital is Trinidad; p. 26,371.

Flores, an island of the Azores in the district of Horta. Off Flores, in 1591, occurred the famous sea fight between the *Revenge*, commanded by Sir Richard Grenville, and several large Spanish ships; p. 10,000.

Flores, Venancio (1800-68), Spanish-American soldier, was born in Paysandu, Uruguay. He became leader of the 'Colorados,' the party of revolt. Several times he attempted unsuccessfully to seize the presidency of Uruguay.

Florets, the little individual flowers that make up the more dense inflorescences, as in the capitula of daisies or dandelions.

Florian, Jean Pierre Claris de (1755-94), French novelist, was born near Paris. He was a relative of Voltaire by whom he was somewhat influenced. His fame rests on his *Fables* (1792), which take rank among the best in the language, being characterized by aptness, piquancy, and point.

Floricans, East Indian birds, nearly allied to the bustard, which are greatly relished as food, and which are also hunted for the sake of sport.

Floriculture, the cultivation of flowers and decorative plants for æsthetic purposes.

Florida (popularly called the 'Peninsula State'), the most southerly State of the United States. The southern part is marked by large cypress swamps and everglades. See EVERGLADES. The central portion is noted for its immense number of lakes. Lake Okeechobee is the largest in the State and one of the largest wholly within the United States.

Of the rivers, the most important is the St. Johns, navigable for nearly 250 m. There are about 1,150 m. of sea coast, more than half being on the Gulf of Mexico. On the east coast are the harbors of Fernandina, Jacksonville,

and Miami; on the west coast, Tampa, Key West, Apalachicola, and Pensacola. Because of its strategic position Key West is one of the most important harbors in the United States. St. Augustine, Ormond, Daytona, Palm Beach, Miami, Tampa, Orlando, St. Petersburg, and Fort Myers are the principal tourist resorts.

The State is noted for its yellow pine; other valuable trees are the cypress, red cedar, several varieties of oak and catalpa, red bay, magnolia, poplar and gum. Florida ranks high among the States in the value of its fishing interests. It has a natural monopoly on the sponge fisheries; contributes most of the mullet product, and provides oysters, shad, turtles and red snappers. It is estimated that the fisheries produce about a \$20,000,000 catch annually.

Florida is a strong competitor with Cuba in the manufacture of cigars and cigarettes. In these two branches there were 87 factories employing 11,174 persons, with a payroll of \$12,323,250. Their products were valued at \$39,817,657.

The principal institutions of higher learning include the University of Florida at Gainesville; the State College for Women and Florida Agricultural and Mechanical College for Negroes, both at Tallahassee; John B. Stetson University at De Land; Rollins College, at Winter Park; Saint Leo College (R. C.), at St. Leo; and Southern College, at Clearwater. There are also several small private colleges.

Florida was named by Ponce de Leon, who landed on its shores early in 1513, and took possession of it for the king of Spain on the festival day called by the Spanish *Pascua de Flores* ('Feast of Flowers'). Basing his belief on the wonderful stories he had heard, he thought he had discovered a land teeming with gold, and containing magic springs which would insure eternal youth. In search of these he wandered about for some time, but finally abandoned the project and sailed for Spain. In 1521 he again led an expedition to the country, only to incur the hostility of the natives, in conflict with whom he received a fatal wound.

Hernando de Soto, in 1539, anchored in Tampa Bay with about 1,000 men; and, marching through the interior, passed over the northern border, and then continued on to the Mississippi River.

In 1564 a band of French Huguenots built Fort Caroline on the St. John's River, but in 1565 the colony was attacked by the Spanish under Pedro Menendez de Aviles, who massacred the settlers. The first permanent settle-

ment at St. Augustine was founded at this time. In 1606 another Spanish colony was established at Pensacola.

Until 1763, when Florida was ceded by Spain to Great Britain, almost incessant warfare was carried on between the colonists and the Indians and people of the British colonies. In 1783 Great Britain retroceded Florida to Spain; and in 1795 Spain ceded to France all the territory lying west of the Perdido River. In 1812 the United States took possession of the lands between the Pearl and Perdido Rivers, claiming that they were included in the Louisiana territory.

During the War of 1812 a British fleet took possession of Pensacola. Gen. Andrew Jackson, with about 5,000 Tennessee volunteers, hurried to the town, and wrested it from British control, but later withdrew to New Orleans. Pensacola was again taken by Jackson in 1818, and the following year Spain sold the region to the United States for \$5,000,000, possession being given in 1821. On March 30, 1822, Congress organized the Territory of Florida.

In 1835 war broke out with the Seminole Indians. The Indians massacred the American forces under Major F. L. Dade near Fort King, and several hotly contested battles were fought before they were finally subdued, in 1842.

On March 3, 1845, Florida was admitted to statehood. On Jan. 10, 1861, an ordinance of secession was adopted by a convention at Tallahassee, and Florida joined the Confederacy. In 1862 and 1863 Fernandina, St. Augustine, Pensacola, and Jacksonville were captured by the Federals. In 1864 the Battle of Olustee, in which the Confederates were successful, was fought; and the Federals withdrew from the State.

On Feb. 6, 1868, Florida adopted a new constitution, and in June re-entered the Union. In 1876 the Supreme Court of the State overruled the canvassing board's count of the Presidential election returns, and declared the Democratic electors to be successful; but their decision was reversed by the Electoral Commission.

In 1908, President Roosevelt established the Ocala National Forest in Marion county. In 1909 Key West was partly destroyed by a hurricane. Many persons were killed or injured, and the property loss was about \$2,000,000. In 1912 Key West was connected with the mainland by the opening of the Key West extension of the Florida East Coast Railway.

During 1925 Florida was the scene of one of the most remarkable land rushes in the

history of the United States, dwarfing by comparison the wildest times of early Western days. Speculation ran riot and land prices—if not values—soared to incredible heights. The boom continued through part of 1926, until the operation of economic laws brought a rude awakening. It was estimated that some \$400,000,000 were spent upon building in 1925; about \$50,000,000 on new railroad plants, and almost \$8,000,000 on new highways. Then, on Sept. 18, 1926, a tropical hurricane swept the Florida east coast, cutting a 60-mile swath from the Palm Beach district on the north to the Miami region on the south. Nearly 400 were killed and about 6,400 injured; about 40,000 persons were rendered homeless and damage to property was estimated at \$165,000,000.

On Sept. 12, 1928, again, another hurricane, originating in the Windward Islands, swept over the Caribbean Sea and the eastern part of Florida. Tallahassee is the capital of the state, Jacksonville the largest city and Miami next in size; p. 1,897,414. Consult Fairbanks' *History of Florida*; Roberts' *Florida* (1926); Stockbridge & Perry's *Florida in the Making* (1926).

Florida, The, a Confederate cruiser, built (as the *Oreto*) at Liverpool, whence she sailed in March, 1862, the British Government failing to stop her. Before her capture by the U. S. S. Wachusett the Florida did great damage to the shipping of the United States.

Florida Keys, coral or limestone reefs, extending from Cape Florida almost continuously in a curve for about 230 m. They are of Pleistocene or recent geological formation.

Florida, University of, a State institution for men, opened in 1884 at Lake City, Fla., whence it moved to Gainesville in 1905. Over 100 acres are devoted to a demonstration farm, and the remainder of the ground is taken up by the Agricultural Experiment Station.

Florideæ, one of the three groups into which the class of Algæ is divided.

Florin, an English silver coin, value two shillings, first minted in 1849, and deriving its name from the gold coins of 54 grains weight issued in Florence in 1252.

Florio, Caryl (family name WILLIAM J. ROYJOHN) (1843-1920), American organist and composer, born in England. He was the first boy soloist at Trinity Church, N. Y. (1856-60). He produced his own opera *Uncle Tom* in 1881. He organized the Palestrina choir (1886).

Florio, Giovanni (1553-1625), Anglo-Italian author and translator, was born in London. He was appointed (1603) teacher in

Italian to Queen Anne, wife of James I., and instructed Prince Henry, the heir apparent. That with which his name is chiefly associated is his excellent translation of *Montaigne's Essays* (1603), to which there is strong reason to believe Shakespeare was indebted for many ideas.

Florius, an historian of ancient Rome. His preface shows that he wrote in the reign of Trajan or Hadrian. His work is an abridgment of Roman history, chiefly Livy's, from the foundation of the city to the establishment of the empire under Augustus. It was formerly a school book.

Flotation. The equilibrium of floating bodies depends essentially upon the fundamental principles of hydrostatics. The weight of fluid displaced must be equal to the weight of the body. A further condition is necessary to insure stable rotational equilibrium. The center of gravity must be as low as possible. The single resultant of all the fluid pressures acting on the body must act upward through the center of gravity of the body, so as to balance the weight. And since the vertical components of the fluid pressures balance the weight of displaced fluid, the resultant must also act upward through the center of gravity of the displaced fluid. These two centers must therefore be in one vertical line when there is equilibrium. Imagine now a vertical line drawn in the body through its center of gravity when in equilibrium. If the body be tilted slightly, the center of gravity of the displaced fluid will in general no longer be in the same vertical line as the center of gravity of the body. Hence a vertical line drawn now through the center of gravity of the displaced fluid will intersect the former vertical line in a point which is not in general coincident with the center of gravity of the body. This point is called the metacenter of the body. The condition for great stability is that the metacenter should be as far as possible above the center of gravity of the body. This is one of the practical problems which a ship designer has to solve.

Flotow, Friedrich, Baron von (1812-83), German musical composer. His first successful opera, *Le Naufrage de la Méduse* (1839), was followed by *Alessandro Stradella* (1844) and *Martha* (1847), the last two operas winning him great popularity. His later operas were all popular, but only three seem destined to live—*Indra* (1853), *La Veuve Grapin* (1859), and *L'Ombre* (1869). His music is tuneful, lively, and catching.

Flotsam, Jetsam, and Lagan. In English

law, flotsam consists of the goods of a ship that has been lost, which are floating on the sea. The exact meaning of jetsam is doubtful. It is said to consist of goods floating on the sea which have been thrown overboard to lighten a ship that is afterward lost; but Blackstone defines it as goods cast into the sea which sink and remain under water. Lagan, or ligam, consists of goods thrown overboard to lighten a ship which is afterward lost, but which sink to the bottom, and which are marked by a buoy or cork. When any such goods are cast by the sea upon the land they become 'wreck.' In the United States, such derelict property is subject to the laws of salvage, the owner being entitled to claim it, upon making proper compensation to the person who saved it. See WRECK; SALVAGE.

Flounder, a flatfish of the family *Pleuronectida*, of which the halibut, turbot, and plaices are genera. They are of small size, with the body strongly compressed and oval or elliptical in outline, and with both eyes, in the adult, on the same side of the body. The commonest and most important species is the dark brown winter flounder of the Atlantic coast, which rarely exceeds a length of 20 inches and a weight of 5 pounds, and which is taken largely in winter and early spring.

Flour is the product obtained by grinding and bolting cereal grains, especially wheat. There are several kinds of flour, depending either on the method of manufacture or on the cereal from which it is made. Graham flour is unbolted wheat meal. Whole wheat flour or entire wheat flour, improperly so called, is wheat meal from which a part of the bran has been removed. Gluten flour, valuable as a food in certain diseases, is the product made from flour by the removal of starch, and contains not less than 5.6 per cent. of nitrogen. Rye flour is the product made by bolting rye meal. Buckwheat flour is bolted buckwheat meal.

Wheat flour, the product to which the unqualified term 'flour' is always applied, possesses peculiar properties that make it especially desirable in bread making. These properties together produce a tough but elastic dough, which, after permeation with gas, due to yeast fermentation or other gas-producing agencies, and subsequent baking, forms an exceedingly light and porous food, easily digested, and possessing all the nutritive properties of the original wheat. The nitrogenous constituents of the flour yield, when mixed with water, a characteristic product termed gluten, possessing the elasticity and tenacity

essential in bread dough. The flour of most other cereals, when used for bread, is mixed with wheat flour.

According to the Standards of Purity for Food Products established by the U. S. Department of Agriculture, wheat flour should contain not more than 13.5 per cent. of moisture, not less than 1.25 per cent. of nitrogen, not more than 1.00 per cent. of ash, and not more than 0.50 per cent. of fiber.

The conversion of cereal grains into meal or flour for purposes of human consumption dates back to prehistoric times, when the simple mortar and pestle was the only means of grinding grain. This was followed by the saddle stone, an implement consisting of a hollowed stone on which the grain was ground into coarse meal by means of another stone worked backward and forward, and this in turn by the quern, the first grinding device based upon the principle of rotary motion. The early type of quern, which was somewhat globular in shape, soon gave way to flat millstones, universally employed till well into the 19th century, and still found in some small customs mills.

Cattle, slave labor, and water power were applied to the driving of millstones by the Greeks and Romans, and water mills seem to have been in use in Northern and Western Europe before historic times. They were introduced into England in the time of Julius Cæsar, and windmills made their appearance there before the close of the 12th century. In the United States horse power was used in the earliest mills, and survived in certain of the Southern States until as late as 1870. Steam was first applied to the grinding of grain in London in 1784.

The third epoch in the history of flour making dates from the invention of the roller process and the middlings purifier early in the 19th century. In 1810 Ignaz Paur, an Austrian, invented a middlings purifier; experiments with roller mills were carried on in Paris, Vienna, and Switzerland as early as 1820; and roller mills were successfully used at Budapest before 1840. In 1870 a French miller named La Croix introduced the middlings purifier at Minneapolis; and improvement of the La Croix machine was later made by George T. Smith, and representatives from the largest mills in Minneapolis went to Europe to study the Hungarian system.

In the actual process of flour manufacture the grain is elevated to the top of the mill and then carried by force of gravity from one machine to another, passing through three

main operations—cleaning, tempering or conditioning, and milling proper.

Flour naturally becomes whiter with age, and for many years storing was resorted to in order to meet the public demand for the whitest possible product. The difficulty of storage on a large scale, however, and the inconvenience experienced by the tying up of capital during the aging period, led to the substitution by many manufacturers of artificial bleaching by nitrogen oxides. The practice of artificial bleaching has aroused much controversy, its opponents claiming that it increases the acidity of the flour, lessens its bread-making qualities and digestibility, and gives rise to products of markedly toxic effect on animals; its adherents declaring that the only change taking place is that of oxidation.

Numerous substitutes have been suggested for wheat flour, those most generally employed being prepared from other cereals—as rye, corn, and buckwheat—and used in combination with the wheat product. Other flour substitutes have been prepared from the banana, cassava, dasheen, and sweet potato, and from soy beans and peanuts; all of these being used with wheat flour in the proportion of about one to three.

Bibliography.—Consult P. A. Amos' *Processes of Flour Manufacture* (1912); Farmers' *Bulletins* Nos. 112 and 249 of the U. S. Department of Agriculture; Amos' *Processes of Flour Manufacture* (1925); Edgar's *Story of a Grain of Wheat* (1925); *One Hundred Years of American Commerce* (1895).

Flourens, Jean Pierre Marie (1794-1867), French physiologist and anatomist, born at Maureilhan (Hérault). He became permanent secretary of the Academy of Sciences (1833), and was elected to the French Academy in 1840. Among his best known works are *Expériences sur le Systeme Nerveux* (1825); *Cours de Physiologie Comparée*; *De la Vie et de l'Intelligence* (1856), etc.

Flower, the sum of the reproductive organs of any phanerogam. These consist of a shoot or part of a shoot, comprising the perianth, the sporophylls and that portion of the axis from which they spring. All flowers may be reduced to a single simple plan. A typical flower consists of four whorls—the sepals, the petals, the androecium, or male system, and the gynoecium, or female system; and it is from the modification of one or more of these whorls that the various forms of flowers arise.

In monocotyledons the two outer whorls (the sepals and petals) are often much alike. It is usual to speak of these whorls as the peri-

anth, and the parts of each whorl as perianth segments or leaves—these are usually in threes. Thus the perianth consists of six leaves. In dicotyledons the most general number for the parts of a whorl is five. The parts may be distinct, as in the buttercup, which is said to be polypetalous; or united, as in the primrose; which is gamosepalous.

The second whorl is formed by the corolla; its parts, which are called petals, are of a more delicate nature than the sepals, and commonly brightly colored or white. Like the calyx, its parts may be distinct or united, and are said to be respectively polypetalous or gamopetalous. Although the corolla is to some extent protective, its chief end is to attract insects by its conspicuous colors and perfume. Another attraction often found in the corolla itself is nectar. When this is the case the glands which secrete this liquid are generally at the base of the petals, as in the buttercup; so that in order to reach it insects must brush against the stamens, and so carry off pollen to be distributed to other flowers which may be visited for food.

The two inner whorls are the essential or reproductive organs. The third whorl consists of the stamens, constituting the androecium or male system. They are inserted in various ways, but always within the corolla and outside the bistil when these are present.

Great diversity occurs in the innermost whorl, which may consist of a single carpellary leaf united by the edges, as in the pea; an aggregation of carpels, as in the buttercup; or a union of carpels, as in the lily, the tulip, and the poppy. This part of the female system is the ovary, and its upper part is the stigma, the top of which exudes a viscid fluid or is covered with hairs, the object being to secure the adhesion of the pollen.

Pollination, or the distribution of pollen and its application to the stigma, is effected in various ways. In wind pollination there is a good deal of waste, consequently anemophilous plants yield enormous quantities of pollen. Insects are the chief pollen distributors, and the various modifications of entomophilous plants to secure pollination border on the marvellous. Pollen is also carried from flower to flower by nectar-feeding birds, and in some few cases by snails. In the first the plants are said to be ornithophilous, and in the second malacophilous.

Fertilization results from the mixing of the contents of the pollen grain with those of a cavity in the nucleus of the ovule—that is, of the male and female elements. Cross-fertilization, or allogamy, would seem to be the rule in

nature, for there are many plant adaptations which prevent or hinder self-pollination. See Kerner's *Natural History of Plants* (trans. Oliver, 1902); Henslow's *Origin of Floral Structures* (International Science Series, lxiv., 1888); Lubbock's *Wild Flowers in Relation to Insects* (1873); Charles Darwin's *Effects of Cross- and Self-Fertilization in the Vegetable Kingdom* (1878), and other treatises on plant-life. See BOTANY.

Flower, Roswell Pettibone (1835-99), American financier, was born at Theresa, N. Y. In 1891 he was elected governor of New York, serving until the end of 1894. He made considerable bequests to church and charity, and built and equipped the Flower Hospital in New York.

Flower, Sir William Henry (1831-99), English zoölogist and comparative anatomist, born at Stratford-on-Avon. He was an expert craniologist, unsurpassed as a comparative anatomist, and had great experience as an organizer of museums. He was the author of *Introduction to Osteology of Mammalia* (1870), *Fashion in Deformity* (1881), and *The Horse* (1890).

Flowering Rush (*Butomus umbellatus*), a European plant, growing in stagnant or nearly stagnant water. It has long sword-shaped leaves, and bears at the summit of a long stalk an umbel of large reddish flowers.

Flower of Jove, a term which has been applied to several flowers, including the carnation, the generic name for which, *Dianthus*, is a Greek equivalent for the expression. It is now more commonly given to *Lychnis flos-Jovis*.

Flowers, Artificial, are made for the purpose of ornamenting ladies' hats, bonnets, and dresses, although their use for other decorative purposes is greatly on the increase. France is the chief center of their production; but in other parts of Europe and the United States large quantities are produced. Other materials employed in their manufacture are grown glass, brass, and mother-of-pearl.

Floyd, John Buchanan (1807-63), American politician and soldier, born at Blacksburg, Va. In 1857 he became secretary of war in the cabinet of President Buchanan. In this position he was characterized by an 'utter incapacity for the proper and systematic transaction of business' (Rhodes), and late in 1860, he was asked by President Buchanan to resign. His administration of his department has given rise to much controversy, but it does not appear that he was personally corrupt, or that he himself profited in any way, or that he was

deliberately and intentionally dishonest in his dealings with the contractors. On the outbreak of the Civil War, he became a brigadier-general in the Confederate service. He was in command of Fort Donelson in Feb., 1862, but when surrender seemed inevitable relinquished his command and escaped from the fort.

Floyd, William (1734-1821), American patriot, a signer of the Declaration of Independence, born at Brookhaven, N. Y. He was a member of the Continental Congress (1774-7 and 1778-83), and though his instructions prevented him from voting for the Declaration of Independence on July 4, 1776, he signed that document on Aug. 2.

Fludd or Flud, Robert (1574-1637), English physician and Rosicrucian, born at Bearstead, Kent. His fame rests on his writings, wherein he advocated a system affirming the identity of physical and spiritual truth. De Quincey writes of him as a father of Freemasonry. See De Quincey's *Works*, vol. xvi., p. 406.

Flügel, Johann Gottfried (1788-1855), German linguist and lexicographer, born at Barby, near Magdeburg. His life-work was his *Universal English-German and German-English Dictionary* (1830; 4th ed. 1891), which has become a standard work.

Flügel Horn, a generic term applied by Germans to brass wind instruments of the bugle family, but in the British and German armies given more particularly to a B♭ cornet with pistons and a horn mouthpiece.

Fluid, the general name given to that form of matter which cannot resist permanently any shearing stress, however small. It does not possess elasticity of form. Liquids and gases are the two types of fluid generally recognized.

Fluorescence and Phosphorescence are two closely connected properties of certain substances. A fluorescing substance is one which rejects or throws back to the eye rays of light of a color or wave-length quite different from the color or wave-length of any of the rays originally falling upon it. Fluorescence was first observed by Sir John Herschel, but was first carefully studied, and its true nature discovered, by Sir George Stokes. In recent years the platino-cyanides of barium and calcium have come to the front as fluorescing substances. They fluoresce to the Röntgen rays as well as to ultra-violet rays, and are thus very valuable in certain surgical demonstrations.

A phosphorescent substance has the power of continuing to shine like a self-luminous body for some time after the removal of the

incident light by which it was originally illuminated. Becquerel, in his elaborate study of this phenomenon, found that many substances were phosphorescent for a short but measurable time after the illuminating rays were cut off, so that the property was a much more general one than had been at first imagined.

Dynamically, as was clearly pointed out by Stokes, phosphorescence and fluorescence are the same phenomenon, the one difference being in the longer duration of the former. See Stoke's *Burnett Lectures on Light* (1884-7), and Tait's *Light* (3d ed. 1900, pp. 176-178).

Fluorescin ($\text{OC}(\text{C}_6\text{H}_5(\text{OH})_2)_2\text{OC}_6\text{H}_4\text{CO}$) is a dye prepared by heating phthalic anhydride with resorcin. It is a brown powder that dissolves in water to form a solution with a beautiful green fluorescence; it has a certain, though very fugitive, dyeing power.

Fluorine (F 19) is an element of the halogen group, occurring chiefly in fluor spar or calcium fluoride (CaF_2), cryolite (Na_3AlF_6), and some other minerals. Though it has long been known to exist in combination, it was only isolated as recently as 1886 by Moissan, owing to its very active properties. Chemically, fluorine is most interesting from its intense activity; it unites directly, and with inflammation, with silicon, carbon, hydrogen, and almost all other elements, even in the dark. Hydrogen fluoride is useful mainly for etching glass. Calcium fluoride is the most important of the metallic fluorides. See Moissan's *Le Fluor et ses Composés* (1900).

Fluorspar, or **Fluorite**, is a mineral consisting of calcium fluoride (CaF_2). It crystallizes in the cubic system (sp. gr. 3.1), and perfect and beautifully formed and colored crystals are common in many localities. If they are colorless and transparent, they are used, because of their optical properties, in the manufacture of microscopic objectives and other refined optical instruments. The greatest consumer of fluorspar is the steel industry, and a large consumer, the aluminum industry.

Flushing. Former village, Queens co., Long Island, N. Y., now included in New York City. It is situated on Flushing Bay, an arm of the East River, and is an attractive residential place of the suburban type. It is the seat of several educational institutions. It was settled about 1645.

Flustra, a genus of Polyzoa, whose members are usually called sea-mats.

Flute, a musical wind instrument consisting of a tube of wood or metal jointed in several parts, and open at the lower end. The air

column of this tube is set in vibration by being blown into at or near to its upper end. A new method of construction and system of fingering were introduced into Great Britain by Boehm about 1834. Shortly after this Boehm discovered that a cylindrical bore produces a broader tone of a much more reedy quality than that obtained from a conical bore. With Boehm's system of construction, the instrument is in tune in practically all keys; and while cross-fingering is abolished, the compass is still fully three octaves, with all the chromatic intervals. In the orchestra the flute still holds a highly important position; but as a solo instrument it is less frequently heard now than formerly.

Flute-mouths, fishes of the *Fistulariæ* family.

Fluting, the channelled surface of the shaft of a column. It is composed of a series of upright concave grooves, and a corresponding number of vertical edges, as in the Doric order; in the other orders the arris or edge is pared off, and what is known as a 'fillet' formed. (See COLUMN.)

Fluxes are those substances which are used in the smelting of metals to increase the fluidity of the acting materials, and thus to allow them to come into more intimate contact, to enable the separated metal to settle more easily, and to dissolve earthy impurities. The term is also used to denote those agents employed to prevent the oxidation of or clean the surfaces of metals that are to be joined by welding or soldering.

Fluxion, the rate of change of a variable quantity. Thus, velocity is the fluxion of position, acceleration the fluxion of velocity, force the fluxion of momentum, and so on. The word was introduced by Newton, who also used the term *fluent* to refer to the quantity itself whose rate of change was the fluxion. See CALCULUS, INFINITESIMAL.

Fly. See *DIPTERA*; *House-fly*; *Gnat*, etc. For artificial flies, see ANGLING.

Fly-blister. See *Cantharides*.

Fly-catcher, a name applied to two families of passerine birds: the *Muscicapida*, or true fly-catchers, which are exclusively Old World forms, and the *Tyrannida*, or American fly-catchers which include the Kingbird, Crested Fly-Catcher, Phoebe, Olive-Sided Fly-Catcher, Wood Pewee, Yellow-Bellied Fly-Catcher, Acadian Fly-Catcher, Traill's Fly-Catcher, and Least Fly-Catcher or Chebec. See KINGBIRD; PEWEE.

Fly-fishing. See *Angling*.

Flying Animals, in the strict sense of the

term, comprise only winged insects, birds, and bats; but certain fish, reptiles, and amphibians, and a number of mammals other than bats, have a limited power of flight, and may be included under this head.

Among fish two very distinct genera (*Exocoetus* and *Dactylopterus*) have the power of skimming for considerable distances above the surface of the water, their expanded pectoral fins forming a parachute (see FLYING FISH). Flying reptiles are exemplified by certain species of the lizard *Draco*. (See DRACO; LIZARDS); by some varieties of *Gecko*—e.g. the Californian *Phyllodactylus tuberculatus*—and by certain extinct reptiles (see PTERODACTYLS). Among amphibians is the Flying Frog or Tree Frog (*Rhacophorus*) (see FROGS). It is among mammals, however, that attempts at parachute flight are most frequent, occurring not only in bats, but in certain marsupials, such as the Flying Phalanger; some species of rodents, as the Flying Squirrel; and some insectivores, of which the Galeopithecus or Flying Lemur is characteristic.

Flying Column, a military term, denoting a small but complete body of troops, including infantry, cavalry, and sometimes horse artillery, equipped with its own supplies. It is organized for rapid movement from place to place, independent of any particular base of operations, and is used, as a rule, for some special purpose—as to relieve a garrison, capture a strategic point, or harass the forces of the enemy.

Flying Dutchman, the apparition of a Dutch vessel, said to be encountered off the Cape of Good Hope, and regarded as a portent of evil. Legend relates that a Dutch captain, Van Straaten, was condemned, for murder or blasphemy, to beat up against the storms of the Cape until Doomsday, without reaching heaven. Wagner's opera *Der Fliegende Holländer*, Fitzbald's drama, *The Flying Dutchman* and Marryat's novel, *The Phantom Ship*, are all founded on the legend.

Flying Fish, a name applied to certain bony fish of the genera *Exocoetus* and *Dactylopterus*, which, by virtue of an elongation of the rays of the pectoral fins and an extension of the interradial membrane, are capable of flight or sustentation in the air.

The flying fish proper (*Exocoetus*), of which more than forty species are known, occurs in shoals, chiefly in the warmer seas. It is characterized by the great length of the pectoral fins and the blunt, short-jawed head. Its average length is about one foot. The course is

parabolic, like that of a projectile, and is usually close to the water.

The *Dactylopterus*, or Flying Gurnard, sometimes called the Sea Bat or Flying Robin, measures from 12 to 18 inches.

Flying Fortress. Powerful four-engined Boeing, used in the second World War by the U. S. Army Air Corps for bombing enemy concentrations. Gun emplacements make them practically attack-proof.

Flying Phalanger, or **Flying Opposum**, a name applied to several small marsupials, natives of New Guinea and Australia, where they are known as Flying Squirrels. They are nocturnal in habit, and feed on fruits, leaves, and insects.

Flying Robin, a fish allied to the gurnard, belonging to the family *Cephalacanthidae*. It is distinguished by the great size of its pectoral fins, which are used in the same way as those of the true flying fish, although their appearance is very different.

Flying Squid, or **Sea Arrow**, popular names for a genus of cuttle (*Ommastrephes sagittatus*), sometimes called by naturalists the 'Winged Calamary.' Like other cuttlefish, these squids swim rapidly by forcibly ejecting water from their mantle or gill cavity. They occur freely in the North Atlantic, and are extensively used as bait in the cod fisheries of Newfoundland. See CUTTLES.

Flying Squirrel, a name applied to members of two families of rodents: the *Sciuridae* squirrels, including the genera *Pteromys* and *Sciuropterus*, and the *Anomaluridae*, to which belong the flying squirrels of Africa. The former are distributed throughout Europe, Asia, and North America, and are characterized by the possession of a flying membrane (*patagium*) extending from the flanks between the fore and hind legs. The common North American Flying Squirrel (*Sciuropterus volans*), or Assapan, abundant in the woods from Upper Canada to the Gulf of Mexico is in habit nocturnal and arboreal.

Flynn, William James (1867-1928), American public official, was born in New York City. In 1910-11, as second deputy commissioner of the New York Police Department, he reorganized the New York detective bureau; and in 1912 was promoted to be chief of the U. S. Secret Service.

Fly River, a large river in Southern New Guinea. It rises in Victor Emanuel mountains near the central part of the island and empties into the Gulf of Papua. It is almost 800 m. long and for nearly 100 m. of its course forms the boundary between Dutch and British New

Guinea. As it enters the Gulf of Papua it forms a huge estuary nearly 50 m. in width. There are two large tributaries, the Strickland and the Alice, and about 500 m. from its mouth the Fly itself divides into two nearly equal branches, the left of which is known as the Palmer River. The river was first discovered in 1842 and was explored in 1875-77 by D'Albortis. Consult W. N. Beaver's *Unexplored New Guinea* (1920).

Flysch, a massive sandstone formation which is a characteristic member of the Cretaceous and Lower Tertiary rocks of the Eastern Alps. It is known also as the Vienna Sandstone, the Carpathian Sandstone, and Macigno.

Fly Snapper, a name applied to a species of American flycatcher found in Southern California, Nevada, and Arizona.

Flywheel, a large, heavy-rimmed wheel attached to a machine or a steam or gas engine. By its momentum it tends to maintain equal velocity of the engine during each complete revolution. Its action depends on the principle that matter in motion possesses kinetic energy. The velocity should not exceed 80 ft. per second for cast-iron wheels, and 50 ft. per second for built-up wheels.

In a single-cylinder steam engine the flywheel preserves the energy gained during the most effective portion of the stroke and carries it over the least effective part, or dead center, so that an even velocity is obtained throughout the stroke. The same result is attained in a gas engine, in which the explosion occurring at one point of each stroke would tend to produce a succession of jerks, if the surplus energy were not absorbed by the mass of the flywheel, to be given out again through the remainder of the stroke.

Special designs of wheel have been successful at speeds of 200 ft. per second. In C. H. Benjamin's bursting tests of fly-wheels, various types of cast-iron wheels burst at speeds of 190 to 425 ft. per second. Wheels built up of steel-plate segments, bolted and keyed together to form a ring or a disc, have been used for heavy wheels requiring to be run at very high speed. For Benjamin's tests, consult *Proceedings American Society of Mechanical Engineers*; for designs of fly-wheels and rim joints, and tables of speeds, Halsey's *Handbook for Machine Designers and Draughtsmen*.

F. O. B., an abbreviation of *free on board*, used on invoices of goods when the seller contracts with the buyer to pay the cost of transport by ship or freight train. His responsibility

then ceases, and the goods thenceforth belong to the buyer.

Foch, Ferdinand (1851-1929), French soldier, generalissimo of the Allied armies during the Great War (1914-18), was born in Tarbes, Southern France. At the outbreak of the Great War General Foch was called from Nancy, headquarters of the Twentieth Corps, to take command of the Ninth Army. At the Battle of the Marne, in command of the French center, he shared with Marshal Joffre the credit for stopping the German advance on Paris, at Ypres he led the French and British armies in the action that saved the channel ports, and in 1916 he took part in the Battle of the Somme. He represented France on the Supreme War Council of the Allies, and on March 29, 1918, was placed in supreme command of the Allied forces on the Western Front. He halted the great German advance of the spring of 1918, and conducted the powerful offensive that drove the enemy back along the entire western front, and resulted in the signing of the armistice (Nov. 11, 1918) that ended the war (see *ARMISTICE*).

In 1921 he visited the United States where he was everywhere welcomed with acclaim and received degrees from almost every university in the country. He died in Paris, March 20, 1929.

General Foch was made a grand officer in the Legion of Honor following the Battle of the Marne; King George of England bestowed upon him the Grand Cross of the Order of the Bath and the Order of Merit, and President Wilson awarded him the Distinguished Service Medal. He was made Marshal of France in September, 1918, and later was elected a member of the French Academy. He was the author of *The Principles of War* and *The Conduct of War*.

Focus, in its original and usual significance, is a point toward which rays of light and radiant heat are made to concentrate, so as to produce an intense brightness and heat. By generalization, it is applied to any point through which a number of rays pass, or act as if they had passed, although no intense heat is produced.

In Geometry, the term focus is used in a general sense as a point through which important lines pass, or with reference to which the connected curve or surface has special properties. The term is also used as a source of energy—e.g., *seismic focus*, the center of an earthquake disturbance. In Photography, to focus an image is to vary the distance of the ground-glass screen from the lens in front so

that the picture presented is clearly defined. In Medicine the term denotes the chief center of a morbid process.

Fodder, the food collected by man for the use of live stock on the farm, as hay, grass, straw, cut green food, and roots. *Fodder crops*, as distinct from root crops, include grass, clover, cowpeas, alfalfa, field peas, corn, rye, barley, oats, vetches, and the like. See AGRICULTURE; FEEDING STUFFS; ENSILAGE; HAY.

Fœtus, or **Fetus**, the term applied to a young viviparous animal as soon as its several members are distinctly formed, but before it has as yet attained development sufficient for independent existence. The foetal stage is preceded by the *embryonic* stage of life, in which



Marshal Foch.

the organism is more rudimentary (see EMBRYOLOGY). In the human subject it is usual to speak of the embryo after the end of the third month as the foetus.

Fog, a meteorological phenomenon due to condensation of aqueous vapor on dust particles and ions, by the cooling of masses of air in various ways, and by the commingling of two currents of air of different temperatures. Fog differs from cloud in being close to or in contact with the earth's surface, and from mist in the greater fineness of its watery particles. The fogs on the Banks of Newfoundland are

caused by the warm, moist currents of air from the Gulf Stream being carried over the cold water of the Banks.

A converse cause of fog production is the sudden chilling of saturated air in contact with a warm surface of water. Fog is also formed by radiation when the ground is cooled below the dew point (see DEW). Fog bow is a white rainbow seen in a thick fog. Fog crystals are a form of solid precipitation frequently observed on mountain summits, and occasionally at lower elevations, during intense frost combined with thick fog. See DUST, ATMOSPHERIC; FOG SIGNALS; HAZE; SMOKE. Consult J. Aitken's *Dust Fogs and Clouds*.

Fogazzaro, Antonio (1842-1911), Italian poet, novelist, and philosopher, was born in Vicenza. Fogazzaro first attracted the attention of the literary world by the publication of his poem *Miranda* (1874) and a volume of lyrics, *Valsolda* (1876); but it is mainly as a prose writer that he is known. His first novel, *Malombra* (Eng. trans. *The Woman*, 1907), was published in 1881, and was followed by *Daniele Cortis* (1885; Eng. trans., *The Politician*, 1908), considered by some his best work, by *Il Misterio del Poeta* (1888), and by his famous trilogy *Piccolo mondo antico* (1895), *Piccolo mondo moderno* (1901), and *Il Santo* (1905), translated into English (1907) respectively as *The Patriot*, *The Sinner*, and *The Saint*. The publication of *Il Santo* brought Fogazzaro into direct conflict with the Church. It was condemned by the Holy Office and placed on the Index. Consult *Life*, by Molmenti.

Fogelberg, Bengt Erland (1786-1854), a Swedish sculptor, was born in Gothenburg. He is perhaps best known for his Odin, one of the three colossal marble statues of the Scandinavian gods at the National Museum of Stockholm.

Foggia, city and episcopal see, Italy, capital of Foggia province. The twelfth-century Norman Cathedral was damaged by an earthquake in 1731, and has been largely rebuilt in modern style. An important fair is held annually in May; p. 91,975.

Fogo, the loftiest of the Cape Verde Islands, lying to the west of Santiago; area, 170 sq. m. The chief town is Nostra Senhora da Luz; p. 16,000. See CAPE VERDE ISLANDS.

Fog Signals are of two classes—those made by vessels to indicate their positions to others for the purpose of avoiding collision, and those made by shore stations to give warning of danger to approaching or passing vessels.

The International Rules for the navigation

of vessels 'in a fog, mist, falling snow, or heavy rainstorm' provide among other regulations that vessels must proceed at a moderate speed and must be provided with a whistle or siren, an efficient foghorn to be sounded by mechanical means, and a bell.

Coast fog-signals are of three types—aerial-acoustic; submarine-acoustic; and wireless or radio-fog-signals. The use of wireless fog-signals has been greatly extended during the last fifteen years and is of importance to aerial as well as marine navigation. Such signals and also submarine signals are unaffected by atmospheric conditions and are consequently more dependable than aerial sound-signals. Remote control of signals by radio is a fairly recent innovation.

Föhn is the warm, dry wind of Alpine valleys. As the air ascends the mountains it expands and cools, and this cooling condenses the vapor, which falls as rain on the windward side, setting free the latent heat in the vapor. See CHINOOK.

Foil, a thin sheet of metal. The term is limited to material intermediate in thickness between gold leaf and such substances as sheet copper. The chief varieties of foil are copper, tin, lead, aluminium, silver, and gold.

Foil, a weapon. See **Fencing**.

Fokine, Michel (1880-1942), Russian ballet master, first choreographic director of the Russian ballet founded 1909 by Serge Diaghileff. He taught Pavlova and Nijinsky and created a number of ballets, among them *Scheherazade*, *Les Sylphides*, and *Petrouchka*.

Folds. Rock strata seldom lie in their original horizontal position. They are more commonly tilted and, when their separated parts are connected, form a series of arches and troughs that are known as folds. All degrees of folding from shallow and broad to profound and close folds occur. Mountain ranges are regions of excessive folding. Folds are closely related to faults, especially to the overthrust. They are caused by the shrinkage of the earth and the consequent necessity of the more rigid outer layers accommodating themselves to the crustal shortening.

Foley, John Henry (1818-74), Irish sculptor, born in Dublin. Among his chief works are *Caractacus* and *Egeria* (Mansion House, London), the figure of the *Prince Consort* (Hyde Park), *Lord Herbert* (Pall Mall), and *Sir Charles Barry* (Westminster). He designed the seal of the Confederate States of America during the Civil War, and for South Carolina executed his last work, a bronze statue of Stonewall Jackson. See *Cosmo Monk-*

house's The Works of J. H. Foley (1875).

Folger, Charles James (1818-84), American lawyer and politician, was born in Nantucket, Mass. He was secretary of the U. S. treasury in President Arthur's administration in 1881-84. In 1882 he was the Republican candidate for governor of New York, but was defeated by Grover Cleveland.

Folger, Henry Clay (1857-1930), American capitalist, born in New York City. He was president for many years of the Standard Oil Company and also a literary connoisseur who specialized in Shakespeareana. He collected a library comprising some 20,000 volumes including many priceless Quartos and on his death a library to house this unique collection was built adjacent to the Library of Congress in Washington.

Folgoré, Giuseppe, Italian poet of the 13th century, wrote several sonnets, translated into English by D. G. Rossetti and J. A. Symonds.

Foliation. Rocks of the group known as the metamorphic schists and gneisses have usually their component minerals arranged in layers, which are thin, lenticular, often bent or tortuous. They are called folia, and the rock is said to have a foliated structure.

Folk, Joseph Wingate (1869-1923), American lawyer and reformer, born at Brownsville, Tenn. He was elected governor of Missouri in 1904 and was active in the campaign against trust abuses. From 1914-18 he was chief counsel of the Interstate Commerce Commission.

Folkstone, municipal borough and seaport in Kent, 17 m. s.e. of Canterbury. It is a fashionable resort, and has regular packet service with Boulogne. The parish church is an ancient cruciform structure. The Leas is a beautiful parade along the cliffs. In the 18th and early part of the 19th century it suffered much from encroachments of the sea; p. 37, 351.

Folklore, may be defined as traditional literature, beliefs, and practices current among peoples in all stages of culture, and the science of folklore as the science of tradition. One of the earliest writers who in any systematic way set himself to collect folklore was John Aubrey (1626-97), the English antiquary. His *Remains of Gentilisme and Judaisme* is a notebook practically unknown until Brand incorporated in his *Observations on Popular Antiquities* (1777) a few extracts, and it was not printed in its entirety until 1818.

Thomas Percy (1728-1811), in 1765 issued his famous *Reliques of Ancient English Poetry*, the first collection of old ballads in England. Percy's methods were anything but scientific; he did not scruple to alter and amend, or to fill

gaps with sham antique patches. Scott followed in 1802 with his *Minstrelsy of the Scottish Border*, a production of the same character as Percy's, consisting of traditional ballads pieced out with admirable imitations. Arndt made a valuable collection of folk tales and accounts of superstitions about 1811 which furnished a basis for Keightley's more celebrated work later.

Meanwhile the brothers Grimm had started on their quest of folk-tales in Germany. The first volume of their gatherings appeared in 1812. It was the earliest collection formed on the scientific principle of setting down what they heard exactly as they heard it, without embellishment, addition, or omission. In his *Deutsch Mythologie* (1835) Jakob Grimm brought the wealth of his erudition to the exposition of the ancient Teutonic mythology and religious practices, and the book still remains an authority.

During the decade and a half which followed the publication (1859) of *The Origin of Species*, a group of distinguished Englishmen devoted themselves to the investigation of the early condition of mankind and the development of civilization. Chief among them in England was E. B. Tylor, whose two books, *Researches into the Early History of Mankind* (1865) and *Primitive Culture* (1871; 4th ed. 1904), placed the inquiry into the psychological, as distinguished from the physiological, development of mankind on a thoroughly scientific footing.

The importance of folklore arises from the fact that its elements survive among the culture of civilized nations, connecting them with the dim ethnic past. For example, the few of the beliefs and observances now traditional among the peasantry of Europe which are not traceable to a religious source or at least to originals which bear a deep religious imprint. The annual procession and legend of Lady Godiva have been traced to a religious ceremony practiced by the ancient Britons.

The nursery and fairy tales of Europe belong in large part to a common stock. Many of them are found practically all over the world—from Norway to New Zealand, from Guiana to China and the shores of the Arctic Ocean. Where the stories themselves are not substantially identical, they often comprise single incidents which are the same, or, at all events, they embody the same principles, and are obviously sprung from similar processes of thought and similar conditions of human society. Many of the tales of Europe have counterparts in the Brahmanistic beast fables of the East. The famous *Arabian Nights En-*

tertainments is another collection of folk-tales worked up by literary art.

In the United States the term folklore is usually applied to the tradition and myths of the Indians, and the folk tales of the Negro. In 1888 the American Folklore Society was established, and in its journal and memoirs has recorded a mass of important material.

The literature of folklore is enormous. The following is a selection only:—Andrew Lang's *Myth, Ritual, and Religion* (2 vols. 1887; 2d ed. 1899); J. G. Frazer's *The Golden Bough: a Study in Comparative Religion* (1890; 2d ed. 3 vols. 1900); George Lawrence Gomme's *Ethnology in Folklore* (1892); Brinton's *Myths of the New World* (1896); Mooney's *Myths of the Cherokee* (1900).

Folks, Homer (1867), American social worker. In 1893 he became secretary of the State Charities Aid Association of New York, and in 1900 was called upon by the U. S. government to assist in reorganizing the public charities of Cuba. He was commissioner of charities of the city of New York from 1902 to 1904. His numerous papers include a *History of the Care of Destitute, Neglected and Delinquent Children in the U. S. during the Nineteenth Century* (1900); *The Human Costs of the War* (1920).

Follen, Eliza Lee (1787-1860), American author and reformer, took an active interest in the campaign against slavery. From 1843 to 1850 Mrs. Follen edited the *Child's Friend*. She prepared a memoir of her husband, and published, among other books, *Well-Spent Hours* (1827), *Poems on Occasional Topics* (1839), *Anti-Slavery Hymns and Songs* (1885), *Home Dramas* (1859), and many children's poems.

Follicle, in anatomy, a minute bag or secreting-recess in the body — e.g., a hair follicle, the cup or gland in which the hair is fixed, and from which a new one grows when the old one falls. Graafian follicles are the cystlike bodies embedded in the ovary and containing the ovum.

Folwell, William Watts (1833-1929), American educator. In 1869 he became president of the University of Minnesota, a position which he held until 1884, and after 1907 was professor emeritus. He published *Minnesota, the North Star State; History of Minnesota* (4 vols.), and numerous university and economic papers and addresses.

Fomalhaut, (α Piscis Australis), a white star of 1.3 magnitude, intermediate in spectral type between Sirius and the sun. Fifteen times the solar luminosity is indicated for it by its

parallax of $0.13''$ (Gill), corresponding to a light-journey of twenty-five years.

Fomentation, the therapeutic application of heat and moisture, as well as the substances thus applied. The simplest form consists of several thicknesses of flannel, which, after being dipped in boiling water, are wrung as dry as possible and laid over the affected part. They diminish tension, dilate the superficial blood-vessels, and, by increasing the blood supply of the tissues affected, sometimes resolve early inflammations and accelerate the processes of repair.

Fond du Lac, city, Wisconsin, is an important railroad centre, situated in the heart of a rich agricultural belt. Winnebago Park and Lake de Neve are popular summer resorts. Fond du Lac is located in one of the richest dairy sections of Wisconsin, and has large cold-storage houses for handling cheese and butter. Manufacturing of furniture, machinery, etc., is important; p. 27,209.

Fondi, town, Italy. Notable features are the château, partly in ruins but showing signs of former magnificence, the cathedral of San Pietro, the church of Santa Maria Assunta and the Dominican monastery, containing a chapel in which Thomas Aquinas taught; p. 11,378.

Font, the basin or receptacle for holding the water used in the rite of baptism, is usually composed of stone, and measures about 2 ft. 6 in. in diameter. Usually the font stands at the western end of the church, but in some cases especially in European churches, it stands in a separate chapel or baptistery.

Fontainebleau, town, France, near the Seine. The palace, which dates from Francis I., was a residence of French sovereigns to the abdication of Napoleon in 1814. Its interior is regally adorned, and the surrounding parks and gardens are attractive; p. 16,070. The *Forest of Fontainebleau* covers an area of 65 sq. m., and is renowned for its varied scenery. The forest-village of Barbizon has given its name to a school of painters, Corot, Millet, and others.

Fontane, Theodor (1819-98), German poet and novelist. He is one of the best German writers of historical ballads, only the earliest of which show the influence of old English models. He is better known, however, as a writer of novels.

Fontanesia, a genus of deciduous hardy and half-hardy shrubs belonging to the order *Oleaceæ*. It resembles the common privet, but has a rough bark and drooping branches. The foliage remains unchanged until late fall.

Fontanne, Lynn (1882-), English

actress, began her career in pantomime at the Drury Lane Theatre, London. She toured the United States, 1912-13 and 1916-1920, and since then has played in England and America. Her roles include Raina in *Arms and the Man*, Jennifer in *The Doctor's Dilemma* and Ilsa in *Caprice*. She has appeared with her husband, Alfred Lunt, in many popular Theatre Guild productions, among them *Reunion in Vienna*, *Design for Living*, *Pointe Valaine*.

Fontenay-le-Comte, town, France. Its beautiful church of Notre Dame dates from the 15th to the 17th century, and the Château de Terre Neuve has an interesting art collection. The principal manufactures are hats, coarse linen, and woollen goods; p. 11,000.

Fontenay-sous-Bois, town, France, in the department of Seine, 6 m. e. of Paris. There is a trade in wood and charcoal, and market gardens are numerous; p. 18,129.

Fontenelle, Bernard le Bouvier de (1657-1757), French writer and scientist. In 1691 he was elected to the Academy despite the opposition of Boileau and Racine, and in 1699 was made secretary. This position he held until 1741.

Fontevrault, town, France, contains the ruins of a celebrated abbey, founded at the close of the eleventh century, by Robert d'Arbrissel, consisting of five churches, only one of which remains, a monastery, nunnery, and other buildings. It contained the tombs of several Plantagenet kings, but these have been demolished. Since 1804 the abbey buildings have been used as a prison; p. 2,286.

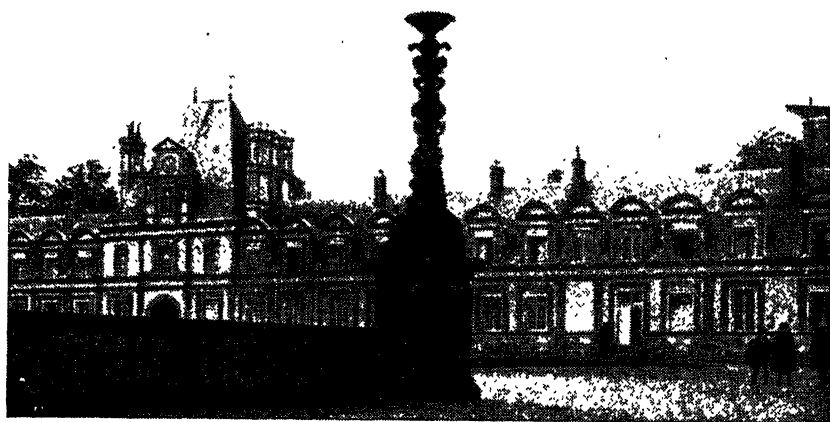
Foochow or **Fu-Chau**, a treaty port and capital of Fu-kien, China, lying about midway between Shanghai and Hong-kong, on the river Min. The city is surrounded by a high wall some 5 m. in circumference, surmounted by numerous towers. Other features of interest are the Black Pagoda, built in 780, and the White Pagoda, built in 880. Foochow formerly had a large export trade in tea, but Ceylon tea has since supplanted it in English trade. It is famous for its lacquer work and silver jewelry; silks, woollens, and furniture are manufactured, and camphor and oranges exported. The port is of importance commercially, but owing to the shallow water, large vessels anchor at Pagoda Island, fifteen miles away. Foochow was made a treaty port in 1842; p. 315,000.

Food, the materials which the body uses to build and repair its tissues, to obtain energy for its activities, to regulate its processes, and to promote its growth and health. Foods are complex mixtures of a variety of compounds

which may be classified as follows:—proteins fats, carbohydrates, minerals, vitamins, and water. The proteins are the foodstuffs which contain nitrogen and comprise by far the greater part of the nitrogen-containing constituents of the food. The more familiar forms of protein are the muscle fibre of meat, the white of egg, gelatin, the curd of milk or cheese, and the gluten of flour or bread. The familiar forms of fat are butter, olive oil, lard, corn oil, cottonseed oil, and meat fat. The carbohydrates include starches and sugars. The cellulose or fibre of plant foods is also a carbohydrate but it is not utilized as food by the human being. The minerals are found in the non-combustible residue left when all the water has been driven off by heating and the dry residue burned. This ash is a mixture of inorganic or

foods. Cases in which wholesome foods are hurtful to individuals are numerous; but such cases are due to an abnormal sensitiveness, and not to the food.

The food finally absorbed into the system functions in three different ways: to yield energy, to build tissue, and to regulate body processes. It must not be thought that any one food substance functions in some one of these three ways and no other. The value of different foods as fuel is taken as a measure of its latent or potential energy. The unit used is the *Calorie*, the amount of heat required to raise the temperature of a kilogram of water one degree centigrade. From such determinations has been ascertained the amount of energy available to the body—that is, the 'fuel value'—for the different nutrients. Thus pro-



The Palace of Fontainebleau.

mineral substances. The vitamins are a group of important organic substances which are present in foods in very small amounts, but which are nevertheless absolutely essential constituents of the human dietary. Water is present in most foods in relatively large amounts.

Food as bought at the market, or even as served on the table, also contains more or less of materials which are usually not eaten, such as the bones of meat and fish, the shells of eggs and nuts, and the skins and seeds of fruits and vegetables. These are known as *refuse*.

Foods are not all digested with equal completeness. The nutritive value of a food depends on its digestibility as well as on its composition. As to agreement of foods with individuals, it may be stated that some persons are differently constituted from the great majority, and have idiosyncrasies respecting

tein and carbohydrates each yield about 4 calories per gram and fat 9 calories per gram.

For persons in good health and with normal digestion it is important to use such kinds and amounts of food as will supply all the nutrients that the body needs, and at the same time avoid burdening it with superfluous material to be disposed of at the cost of health and strength.

Nevertheless, a cardinal principle of rational nutrition is the requirement of a small amount of good food above the average actual need of the body. This furnishes a margin of safety to protect the body in times of stress.

In order to make the best use of food it is helpful to know just what individual foods contribute to the diet. Water furnishes 60 to 70 per cent. of the weight of the body. It is therefore indispensable as a component of the tissues, but it also plays a very important role

in regulating body temperature. At the present time they may be grouped as follows for this purpose:—1, Breadstuffs and other grain products are economical sources of energy and protein but unsatisfactory in their content of minerals and vitamins. 2, Sugars and fats furnish chiefly only energy but some fats are also important for their content of fat-soluble vitamins. 3, Meats, poultry and fish are rich in protein or fat or both but are like the grain products in their mineral and vitamin deficiencies. 4, Fruits and vegetables are extremely variable in their supply of energy and protein but are very important as sources of minerals and vitamins. 5, Milk furnishes energy, protein, minerals, and vitamins and is the most efficient of all foods in supplying the deficiencies of grains. 6, Eggs may be considered as intermediate in nutritive value between meat and milk but the richness of the yolk in antirachitic vitamin gives eggs a special value in the dietaries of nursing mothers and young children.

Many food investigations have been carried on by means of feeding experiments with laboratory animals. This method got its impetus from the discovery of vitamins which occur in foods in such small amounts as not to be detected by the methods of chemical analysis but which are absolutely necessary to normal nutrition in both animals and human beings. Consequently feeding experiments with laboratory animals have been used as the means of determining the relative values of foods as sources of the vitamins. In 1936, after three years of feeding prepared amino acids to white rats, William Cumming Rose and associates at the University of Illinois announced the isolation of a new protein element, alpha-amino-beta hydroxybutyric acid. Without this essential element rats, and presumably men, cannot thrive. Eight other amino-acids were found necessary for health, and this investigation is still going on.

Several important cases of food poisoning have been reported recently. In 1935, arsenic and sodium fluoride in baking soda poisoned 30 fatally in San Francisco; in Murcia, Spain, 6000 were paralyzed by powdered lead in flour. In 1935 about 2000 eaters of cream puffs and eclairs around White Plains, N. Y., were sickened by bacteria in the cream. The 1938 Federal Food, Drug and Cosmetic Act prohibits traffic in foods injurious to health, and requires declarative labeling of foods containing artificial coloring or flavoring, or chemical preservatives.

The wholesale food index in Feb. 1935 on

31 important items rose 30 per cent over Feb. 1934. Since 1937 price trends have been down. See ADULTERATION; COOKERY; DIET AND DIETETICS; DIGESTION; FOOD CONTROL; NUTRITION; PURE FOOD AND DRUG LAW.

Consult publications of the U. S. Department of Agriculture; H. W. Wiley's *Foods and Their Adulteration* (2d. ed., 1912); G. Lusk's *Elements of the Science of Nutrition* (1919), and *The Basis of Nutrition* (1914); H. C. Sherman's *Chemistry of Food and Nutrition* (1926), and *Food Products* (1924); M. S. Rose's *Feeding the Family* (1924), and *The Foundations of Nutrition* (1927).

Food Adulteration. See **Adulteration**; **Pure Food and Drug Law**; **Meat, Government Inspection.**

Food and Drug Administration, of the Department of Agriculture, administers the Food, Drug, and Cosmetic Act of 1938, which is more positive than the Pure Food and Drug Act of 1906. Dec., 1942, the administration revised the program of regulatory operations to meet wartime demands. See **ADULTERATION**; **PURE FOOD AND DRUG LAW.**

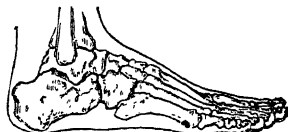
Foods, Preserved, foods which have been treated to ensure their keeping for long periods. Of this class the best known are those to which is applied the name of canned or tinned meats, fruits and vegetables. The principal methods now in common use are sterilization, desiccation or drying, refrigeration, and curing in connection with condimental substances. Where foods are preserved by heating, the ferments and micro-organisms are entirely destroyed; whereas the action of cold hinders their development. Dehydration preserves fruits, vegetables, and other foods by diminishing the water content below that required for the development of micro-organisms.

Sterilization, or preservation by heat, is generally considered the best method and is the one most commonly used both commercially and in home preserving. This method was discovered in 1795 by Nicholas Appert, a Frenchman, and introduced into the United States in 1819. Refrigeration does not kill micro-organisms, but it arrests their growth and is, therefore, an efficient method of preserving food for a limited period. The preservation of food by the use of *condiments*, such as salt, vinegar, and spices, depends upon the fact that bacteria and yeast cannot grow successfully in the presence of these substances. Among the methods employed are dry salting, salting in brine, and pickling in vinegar.

Consult U. S. Department of Agriculture,

Bulletin No. 203; Bureau of Chemistry, *Bulletin No. 48*; Shinkle's *American Commercial Method of Manufacturing Pickles, Preserves, Canned Goods, etc.*; Mrs. Rorer's *Canning and Preserving*; Malcolm's *Successful Canning and Preserving* (1930).

Foolscap, writing paper varying in size from 12×15 to $12 \frac{1}{2} \times 16$ in. Double foolscap is 17×27 in. It is probably so called from the former watermark—a fool's head and cap, said to have been substituted for the royal arms by Cromwell's Rump Parliament.



Skeleton of Human Foot.

Fool's Parsley, a slender annual umbelliferous plant somewhat resembling parsley and having doubly pinnate, dark-green leaves, and terminal, compound umbels of white flowers in late summer. Fool's parsley is a naturalized weed, usually growing about ten inches in height, and is poisonous.

Foot, the lower extremity of the leg in man or animal, on which it rests or moves in walking. The skeleton of the human foot consists of three divisions: the tarsus, metatarsus, and phalanges. There are seven bones in the tarsus: the *os calcis*, the largest and strongest, situated at the back of the foot and forming a strong lever for the muscles of the calf. The metatarsal bones, five in number, are long bones, each divided into a shaft and two extremities. The first is the shortest of all but much larger than the other four. The phalanges, two in the great toe and three in each of the others, resemble those in the hand. Human feet, compared with those of other mammals, present peculiarities due to man's erect position. In cattle and horses the toes are fewer and the nails or claws are developed into a single hoof. In the cat family, as well as in some other animals, there is a tendency towards a rudimentary inner toe, and the ball of the foot is much more developed than the heel. Consult Gray's *Anatomy* (latest edition).

Foot, a measure containing twelve inches, so called from its being taken roughly as the length of a man's foot. A *square foot* is a square whose side is one foot and which therefore contains 144 square inches. A *cubic foot* is a cube whose side is one foot, and which has a volume of 1,728 cubic inches.

Foot and Mouth Disease, Aphtha, or Aphthous Fever, a highly contagious acute fever of a specific nature, characterized by the eruption of vesicles or blisters in the mouth, around the coronets of the feet, and between the toes. It is essentially a disease of cattle, but it also attacks hogs, sheep, goats, buffalo, deer, horses, cats, dogs, and poultry. It occurs rarely in man, chiefly in children and adults who handle sick animals. Outbreaks in America have been quickly suppressed, generally involving the extended slaughter of animals.

Consult *Circulars 141* and *147* of the U. S. Bureau of Animal Industry.

Football is a game played between two contesting sides, each of which endeavors to kick or carry the ball across the goal line of the opponents. Modern football is a direct descendant of the ancient Roman game of *harpastum*. The pastime was probably introduced into Britain at the commencement of the Christian era.

The American Intercollegiate game is the direct outgrowth of the Rugby Union of England. The rules of the Rugby Union were adopted in America in the fall of 1876, and at the time were taken over *in toto*. Since then they have been modified until the American Intercollegiate is a peculiarly scientific game of its own, its principal development being along the lines of off-side interference and passing.

Football has attained mammoth proportions as a college sport.

Football is a game requiring stringent discipline on the part of the players, the development of a carefully planned system of strategic plays on the part of the coach, and a rather generous financial allowance for expenses on the part of the management. Even with the very high cost of maintaining a football team, the gate receipts are counted on to net a sufficient sum for financing the whole program of athletics in the college.

Among the coaches who have contributed to development of the game, the most famous include Walter Camp, Alonzo Stagg, Harry Williams, Glen S. ('Pop') Warner, Knute Rockne, Percy Haughton and Tad Jones.

The Rules Committee, appointed annually by the National Collegiate Athletic Association, has been able from time to time to make such changes in the laws as shall cut out undesirable tendencies and still preserve the general character of the American Intercollegiate game, which has wonderful possibilities in the way of tactics, generalship, and organization.

The game is played on a rectangular field 360

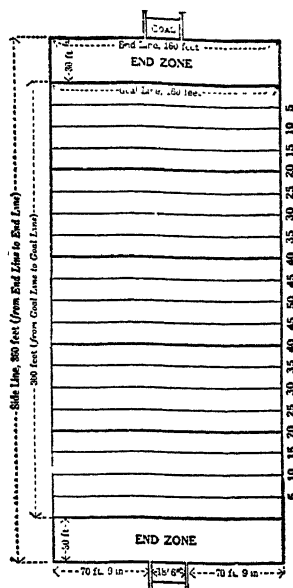
ft. long, of which 30 ft. at each end is behind the goal line, forming the 'end zone,' so-called, and 160 ft. wide, enclosed by heavy white lines marked in line upon the ground. The lines thus 30 ft. from each end are called the goal lines. The goal is placed in the middle of the end lines, and consists of two upright posts exceeding 20 ft. in height, and placed 18 ft. 6 in. apart, with a horizontal bar 10 ft. above the ground. The oval-shaped football used is made of leather, enclosing an inflated rubber bladder. The field is marked off with white lines every five yards parallel with the goal line. Each team has eleven players: seven forwards, right and left end, right and left tackle, right and left guard, and center; and four backs, two half backs, one full back and a quarter-back.

The length of the game is 60 minutes divided into four equal quarters, the ownership of goal posts changing with each quarter. The ball is put into play by a kick, 40 yards out from the kicking side's goal line. After the kickoff, the players rush down the field to stop whoever catches the ball, the catcher's teammates blocking tackles with their bodies. When the catcher is stopped the two teams line up for 'scrimmage.' The seven forwards on the catcher's side crouch down parallel to the goal line. One of them holds the ball which, upon a signal usually shouted out in a secret code, he passes back to one of the four backfield men, who attempts to run with it toward the defenders' goal post. The defending players, in the meantime, arranged themselves as they wished on their own side of the line of scrimmage, the latter being determined by the position of the ball when caught. At the instant the ball is passed back every player begins to move, not indiscriminately, as sometimes appears to the spectators, but according to pre-developed plans or in compliance with the movements of the opponents.

The runner's teammates in the scrimmage line attempt to make openings through the opponent's line for him to get through, and he is also aided by team interference, which starts simultaneously with him. Unless a side makes ten yards toward its opponent's goal-line in four attempts or downs it must surrender the ball. It is usual on the third down, when the needed gain seems unlikely, for the ball to be kicked (punted) instead of carried. When this punt is recovered by an opponent he runs back with it.

The game proceeds in this way until one side or the other has rushed the ball over its opponent's goal-line or time is up. When the ball

has been rushed over the goal-line it is called a touchdown and scores six points. A team which has made a touchdown is allowed to try for an additional point, usually by kicking goal from the field. There are other means of scoring and numerous rules which vary from year to year. See Spalding's *Official Guide to Football* (latest edition).



*American Intercollegiate Football
Field of Play*

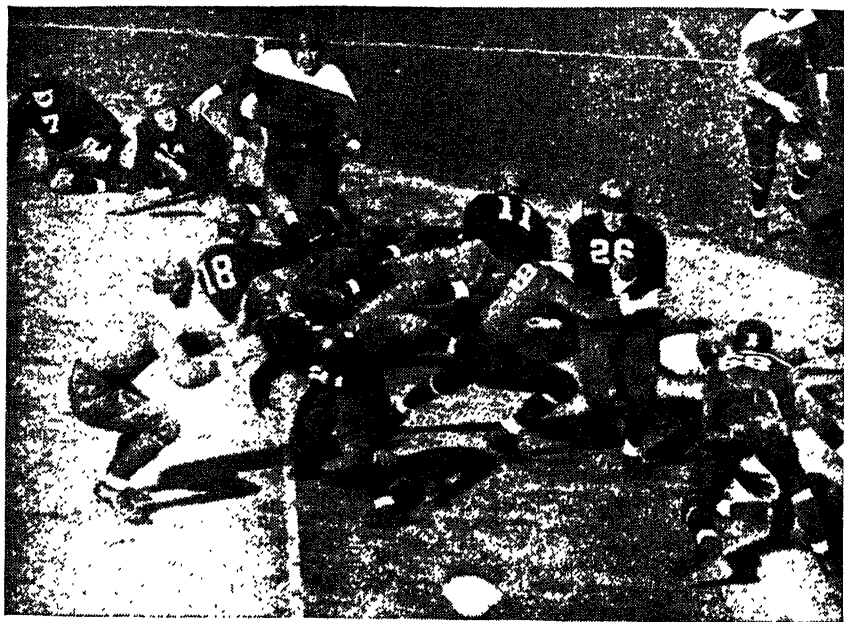
The officials are the referee, who has general oversight and control of the game and who is sole authority for the score; the umpire, who has primary jurisdiction over the equipment, conduct and positions of the players; the field judge, who has primary jurisdiction over the timing of the game, and the linesman, who under supervision of the referee and with the aid of two assistants marks the progress of the ball. All four officials have concurrent jurisdiction over fouls and infractions of the rules, the referee being the final judge in the event of conflict in opinion or testimony.

Association Football.—In association football the object of each team is to send the ball through its opponent's goal, between the uprights and below the cross-bar. The ball is spherical in shape, must not be less than twenty-seven nor more than twenty-eight inches in circumference, and consists of a leather cover over an inflated rubber bladder.

It weighs roughly from thirteen to fifteen ounces. Each team is composed of a goal-keeper, two backs, three half-backs, and five forwards. The maximum size of the ground is 130 by 100 yards; the minimum, 100 by 50 yards. The goals are 8 yards wide by 8 feet high. The usual length of time played is ninety minutes, the two teams changing ends at half-time to neutralize any advantage from wind, etc., The interval at half-time may not exceed five minutes except by consent of the referee. The team winning the toss has the option of kicking off or selecting the goal to defend during the first three-quarters of an hour.

ring the penalty of a free kick until it has been played by one of his opponents. A player is off-side if he touches the ball when it is passed to him by one of his own team from behind him, unless there are at least two of his opponents nearer to their own goal-line than he is at the moment when the ball is kicked to him. Under no circumstances can a player be off-side if he receives the ball after it has been last touched by an opponent, nor can he be off-side in the case of a kick from goal or a corner kick, or if he be behind the ball when it was last played by an opponent or a member of his own side.

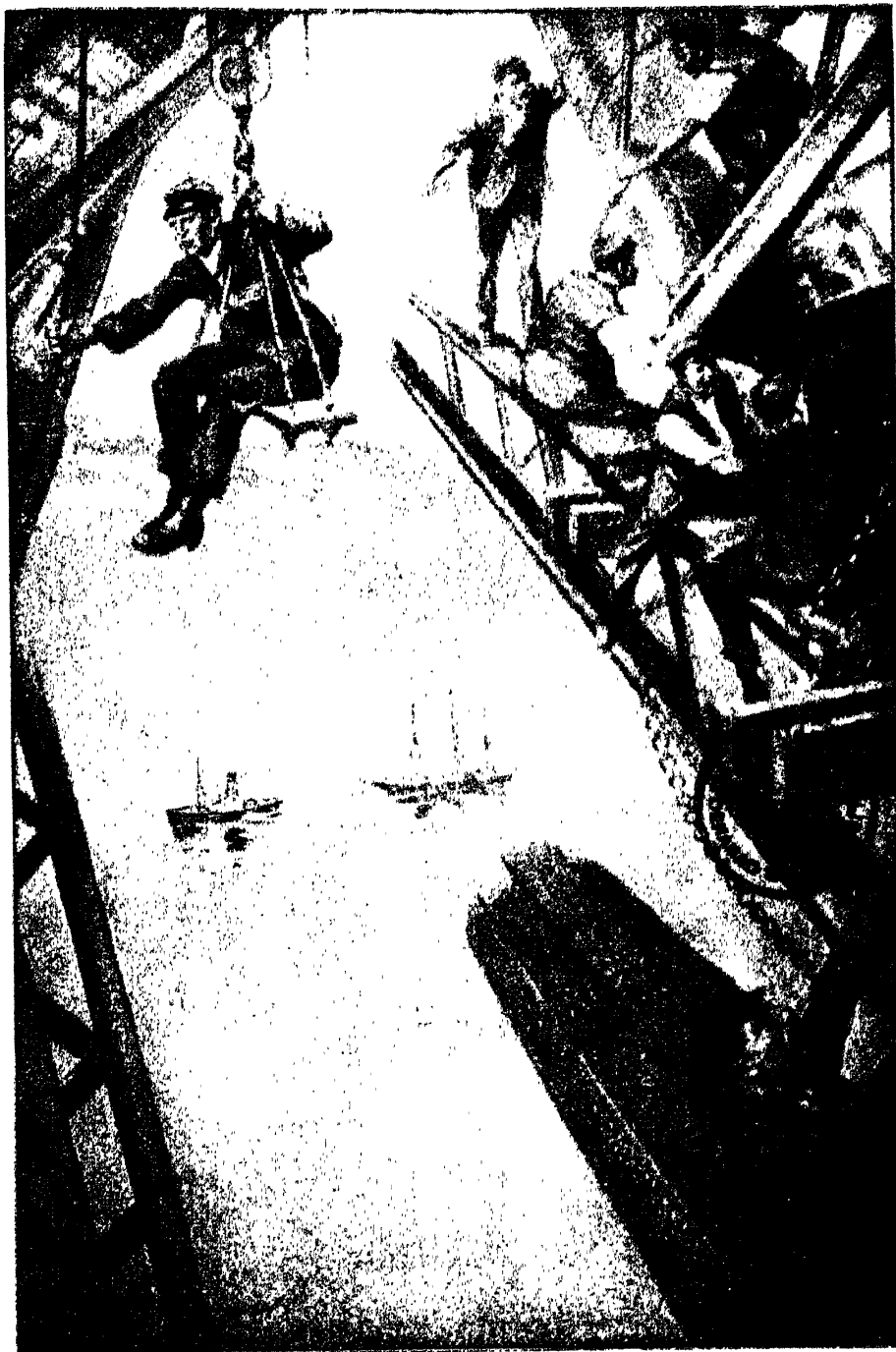
If a player is given off-side by the referee,



Football: An attempt around left end.

The game is started by the centre forward of one side kicking the ball, which is placed in the centre of a circle of ten yards radius in the middle of the ground, no member of the opposing side being allowed within the circle at the time. The goal-keeper on each side is the only man allowed to touch the ball with his hands, and then only in the 18-yard penalty area. He must not carry the ball more than two steps, or his side will have a free kick given against it. The ball can be passed from one player to another in any direction, but a player who is off-side is out of play, and cannot touch the ball or impede an opponent without incur-

ring the penalty of a free kick, no one being allowed within ten yards of the kicker except the members of his own team. Free kicks are also given against a player who intentionally handles the ball, who kicks, trips, jumps at, shoves, or holds an opponent, who charges him from behind (unless the opponent is impeding a player), and who plays in a manner likely to cause injury. A penalty kick is awarded against a player who, when within the penalty area (eighteen yards out, by forty-four yards across from his own goal-line), intentionally, trips, charges from behind, shoves, kicks, jumps at, or holds an opponent. When a



BUILDING THE CELEBRATED FORTH BRIDGE

This bridge with its two mighty spans of 1,710 feet is one of the most remarkable in the world. For seven years an army of intrepid workers labored in mid-air to complete it. It cost \$15,000,000 and 57 human lives.

penalty kick is awarded, all players except the one taking the penalty kick and the opposing goal-keeper (who must not advance from his goal-line) stand outside the penalty area, and the ball must be kicked from a fixed point opposite to the centre of the goal and twelve yards from the goal-line. A goal may be scored from a penalty kick, and from a free kick when awarded for an infringement of Law 9 (which includes tripping, kicking, and intentional handling of the ball), but not from other place kicks.

If a player kicks the ball over the touch-lines at the sides of the ground, it is said to be in touch, and a member of the opposing team

the ball went over. A referee with a whistle acts as timekeeper and judge of the game. He sees to it that all the rules are observed and enforces all penalties, and his decisions are final.

Rugby Union Football, called 'Rugger,' for short, is played on a field not exceeding 110 yards in length and 75 yards in breadth. The ball is oval in shape, and consists of a leather cover over an inflated rubber bladder. The object of each team is to score a number of points by getting tries and goals. A try equals three points, and is made by carrying or kicking the ball into the opponent's in-goal (see



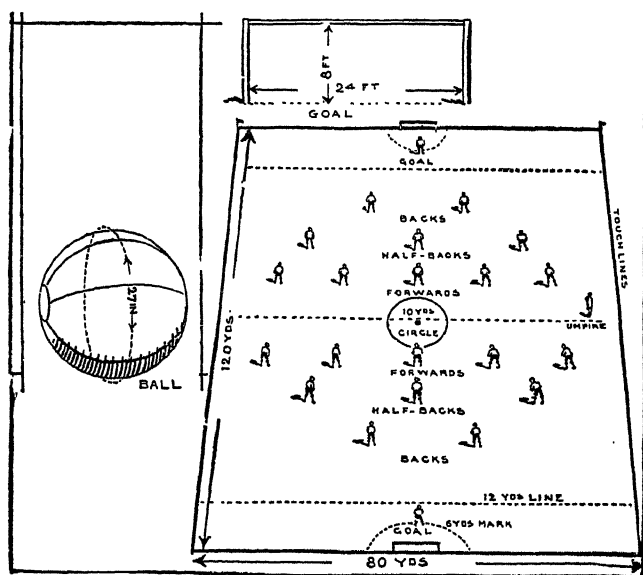
Football: Both lines in perfect action.

throws it in. The thrower must face the field of play, and must throw the ball from over his head with both hands, keeping parts of both feet on the line. A goal cannot be scored from a throw-in direct. If a player plays the ball over his opponent's goal-line, the latter have a goal kick—i.e. a free kick is taken from within that half of the goal area which is nearest the point where the ball went over. If a player plays the ball over his own goal-line, the opposing side take a corner kick—i.e. a free kick is taken from a point within one yard of the corner of the ground nearest the point where

diagram), where it must be placed on, or touched while lying on, the ground. A goal is scored by kicking the ball over the cross-bar and between the uprights of the opponent's goal. There are four kinds of goal—viz. (1) A goal from a try (a placed goal), which equals five points (three for the try, and two for the goal). When a team has gained a try, one of its players brings the ball into the field of play in a line parallel to the touch-lines. He places it on the ground at any distance from the goal-line, and the kick at goal is taken by another player. The opposing side must not cross its

goal-line into the field of play until the ball has been placed on the ground for the kick. (2) A goal from a drop kick (a dropped goal), which equals four points. (3) A goal from a free kick which has been awarded for a fair catch, or, as it is generally known, a mark. This equals three points. If a player catches the ball direct after it has been kicked, knocked on, or thrown forward by an opponent, he can claim a fair catch by instantly making a mark with his heel where he caught the ball. The opposing team cannot advance beyond this mark, and a free kick can be taken from any

or knock it to another player, provided he does not pass, throw, or knock it forward. If while holding or running with the ball he is tackled by an opponent and the ball is fairly held by that opponent with two hands, he must at once put it on the ground. The ball must then either be kicked on, or a scrummage must be formed by the opposing forwards massing in two bodies, putting their heads down and shoving at each other, with the ball on the ground between their feet. The three cases mentioned above in which the ball must not be picked up are, when it is in a scrummage, when it has



British Association Football.

spot behind the mark, in a line parallel to the touch-line. (4) A penalty goal, which counts as three points, and can be scored from a free kick which has been imposed on the opposing team as a penalty for some offence.

Each team consists of one fullback, four three-quarter backs, two half-backs, and eight forwards. The team winning the toss has choice of in-goal or kick-off. The time played is 30 minutes, and the teams must change ends at half-time. The game is started by the kick-off being made from the half-way line, the teams lining up across the ground facing each other. This is also the procedure adopted after a goal has been scored and after half-time. Once the game is started, any player who is on-side may kick or pick up (with three exceptions) and run with the ball. He may pass

been put down after it has been fairly held, and when it is on the ground after a player has been tackled.

A player is off-side if he enters a scrummage from his opponent's side, or if the ball has been kicked, touched, or is being run with by one of his own side behind him. He must not interfere with the game in any way until he is on-side again, which happens when an opponent has run five yards with the ball, or when it has been kicked by or has touched an opponent, or when one of his own side has run in front of him, either with the ball or after having kicked it while behind him. A free kick (unless the offence is unintentional) or a scrummage, at the option of the opposite side, is the punishment for a breach of the off-side rule. Off-side is the most commonly committed

offence in the game; next come passing and knocking the ball forward. Unless a player does these wilfully and systematically (in which case the penalty is a free kick), a scrummage is at once formed where the offence occurred. There are many other less common offences which are punished by a free kick being awarded to the opponents of the offender. The chief are: intentionally handling the ball in or picking it out of the scrummage; not putting the ball down at once when tackled and held; wilfully hacking, or tripping, or impeding an opponent.

When the ball is kicked over the touch-line, it belongs to the side opposite to that which last touched it; but if it is carried over, it belongs to the side which took it over. A player of the side to which the ball belongs can then bring it into play either by scrummaging it at any spot at right angles to the touch-line, ten yards from the place which it went into touch, or he can throw it out at right angles to the touch-line for one of his side to catch. The ball is dead when it or the player carrying it crosses the dead-ball line, or in touch-in-goal, after a player has touched it down behind his own goal, and after a try has resulted in an ineffectual place-kick at goal. The defending side then drop-kicks or punts the ball from its 25 line.

A referee acts as timekeeper and sole judge of the game, two touch judges assisting him by holding up a flag when and where the ball goes into touch, and also helping him in judging a goal and in other ways.

Consult Spalding's *Official Football Guide* (annual); Jeffery's *Football: Association and Rugby*.

Foote, Andrew Hull (1806-63), American naval officer. In 1849-51, as commander of the brig *Perry*, he was engaged in African waters in the suppression of the slave trade, subsequently writing a book entitled *Africa and the American Flag* (1854). He held other important commands and had just received appointment as rear-admiral during the Civil War when he died. Consult *Life* by Hoppin.

Foote, Arthur William (1853-1937), Am. musician and composer. His compositions include pieces for chorus with and without accompaniment for orchestra or piano, songs for one voice and part songs, piano and organ pieces, chamber music, suites, overtures, etc. He is the author of *Modulation and Related Harmonic Questions*, and, with W. R. Spalding, *Modern Harmony*. He was a member of the National Institute of Arts and Letters and fellow of the American Academy of Arts and Sciences.

Foote, Samuel (1720-77), English actor

and dramatist. In 1747 he opened the Haymarket Theatre with his *Diversions of the Morning*. In this and other pieces he introduced well-known living characters, and by his powers of mimicry drew large audiences. Among his chief works are *Diversions of the Morning* (1747-58); *The Minor* (1750); *The Liar* (1762); *The Trial of Samuel Foote* (1763); *The Mayor of Garratt* (1764); *The Bankrupt* (1776); *The Capuchin* (1776). Consult Boswell's *Johnson*; Cooke's *Memoirs*, and Fitzgerald's *Samuel Foote*.

Foot-pound, the work done in lifting a pound through a foot at the earth's surface. The force overcome is the weight of the pound, or the attraction between it and the earth; and as this attraction varies slightly from point to point on the earth's surface, it follows that the value of the foot-pound is not exactly the same at different places. It is slightly less at the equator than in higher latitudes. The corresponding unit of work in the metric system is the kilogram-metre, which contains 7,233 foot-pounds. See also HORSE-POWER.

Foot-rot, a hoof disease affecting sheep characterized by lesions on the heel or at the back or front of the cleft of the foot. An inflammation rapidly penetrates under the horny tissue, while from the ulcerous opening there exudes a thin purulent discharge with a pungent and characteristic odor.

Foot-washing, a religious ceremony practised in different branches of the Church at various times. In the East the use of sandals made necessary the frequent washing of the feet, and it was considered an act of hospitality to perform this service for others. Jesus, at the Last Supper, washed the feet of his disciples, and the Christians of the early post-apostolic age considered the example as mandatory. The ceremony is still solemnly performed on certain occasions by the Pope, a number of bishops and monastic superiors, and by several minor Baptist bodies.

Foppa, Vincenzo (c. 1427-1515), Italian artist, founder of the Lombard school, his influence surviving until Leonardo de Vinci's time. About 1456 he went to Milan, where he adorned the Medici Palace, the hospital, and the Palazzo dell' Arengo with mural paintings, those in the palace portraying scenes from the life of Trajan. In 1461 he returned to Brescia, where he painted in the Church of the Carmine. Between 1480 and 1489 he was engaged in executing an altar-piece for the Bishop of Savona which is now to be seen at the Church of Santa Maria di Castello in Savona. His frescoes include the *Evangelists*; the *Four*

Doctors of the Church; and a *Crucifixion*. Other works are *St. Jerome Penitent before a Cross*; *Adoration of the Magi*; *St. Sebastian*; *Virgin and Child with two Kneeling Prophets*.

Forage, in general, any food suitable for horses or cattle; in military usage in the United States army the food allowance for animals owned by the Government, or owned and kept by mounted officers for their official use.

Forain, Jean Louis (1852-1931), French artist, noted in caricature, etching, lithographing and painting. His satirical sketches show great penetration of Parisian life. His drawings published in book form include *La Comédie Parisienne* (1892); *Doux Pays* (1897). Among his lithographs are 'The Strike,' 'At the Folies-Bergère,' his etchings, 'The Prodigal Son' and 'Mlle. Mere.' Consult Singer's 'Lithographs and Etchings by Forain,' in the *International Studio* (1909).

Foraminifera, a class of unicellular animals or Protozoa, almost always marine in distribution, most characteristically provided with limy shells, which have formed the chalk of the past and are now forming similar deposits in the deep sea. The shell, which is much better known than its tenant, is characteristically calcareous, chambered, and covered with minute holes. When partitions are formed between successive chambers, apertures are left through which bridges of protoplasm preserve the vital continuity. The pelagic forms, as they die, sink gently to the bottom, and are there forming, especially at depths between 1000 and 2000 fathoms, great beds of modern chalk.

Forbes, Archibald (1838-1900), British journalist, was with the German army through the Franco-German War, and in 1872 published *My Experiences of the War between France and Germany*. Among his chief works are *Glimpses through the Cannon Smoke* (1880); *Life of Chinese Gordon* (1884); *Souvenirs of Some Continents* (1885); *Life of the Emperor William of Germany* (1888); *Csar and Sultan* (1894); *Life of Napoleon III.* (1898); *The Black Watch* (1896).

Forbes, James David (1809-68), Scottish scientist. For his discovery of the polarization of heat he was awarded the Rumford medal. His principal works are *Travels through the Alps of Savoy and Other Parts of the Pennine Chain, with Observations on the Phenomena of Glaciers* (1843).

Forbes, Sir John (1787-1861), Scottish physician, in 1840 went to London, where he became physician-in-ordinary to Queen

Victoria and the Prince Consort. He was knighted in 1853. He was chief founder of the *British and Foreign Medical Review* (1836-47).

Forbes, Stanhope Alexander (1857-) English painter, was born in Dublin, of English and French parents.

Forbes-Robertson, Sir Johnston (1853-1937), English actor, was born in London. He made his first appearance as Chastelard in *Marie Stuart*, in London, in 1874. One of his first successes was in 1879, as Sir Horace Welby in *Forget-me-not*. He first appeared as an actor mgr. at the Lyceum, producing *Romeo and Juliet*, Coppee's *For the Crown*, Sudermann's *Magda*, and *The School for Scandal*. Among his later productions were: *Men and Mice*; *The Light that Failed*; *The Conqueror*; *Mrs. Grundy*; *Caesar and Cleopatra*; *The Passing of the Third Floor Back*; *The Sacrament of Judas*. He retired in 1916. Consult his *A Player under Three Reigns* (1924).

Forbidden Fruit, or **Adams Apple**, a name given to various species of the genus *Citrus*. In England it is usually applied to the fruit of the shaddock. In France *C. aurantium*, more like an orange, is known as forbidden fruit.

Force, in dynamics, is defined as that which causes change of 'motion' in a body, where the word motion involves the amount of matter in the body and its velocity. This we now call the momentum = (mass \times velocity); and we measure force by the rate of change of this quantity. Experience tells us that what we call mass is associated with a permanent property of the body—its property, namely, of inertia; and practically we come to regard mass as a constant invariable quality. Measuring it by an appeal to the force of gravitation, we define any other force in terms of it.

Practically in the United States the unit of force is the pound weight; but as this force acting on a pound causes an acceleration of 32.2 ft. per second, it is not the absolute unit of force if we assume the pound to be the unit of mass. For the unit force acting on unit mass produces unit acceleration. By defining the unit mass to be g pounds, or by defining the unit force to be $\frac{1}{g}$ pound weight, we get a consistent system of absolute units. The engineer uses the former system by adhering to the pound weight as the unit force; the physicist prefers the latter system.

In the centimeter-gram-second system of units, the unit force is called the dyne, and

is the force which, acting on one gram for one second, will generate a velocity of one centimeter a second. See *Dynamics; Kinetics*.

Force Bill, a name popularly applied to a bill passed by the United States Congress for the purpose of enforcing the revenue laws. The name is also applied to the act to enforce the Fifteenth Amendment and others.

Forceps, a term used to designate a two-bladed instrument of joined metal with which objects are grasped. The principal application of forceps is in surgery and dentistry.

Small forceps are in constant use by watchmakers and jewelers for placing minute portions of their work in position, and an instrument of the same class is invaluable to the chemist and mineralogist.

Forcible Entry and Detainer, the offence of unlawfully entering upon or retaining possession of real property by means of force or threats of violence. Under the statutes of practically all the States of the United States forcible entry upon land by one out of possession is prohibited as a breach of the peace, and is a criminal offence.

Ford, Edsel Bryant (1893-1943), U. S. industrial leader, son of Henry Ford, was born in Detroit; was Vice-President of the Ford Company in 1917; President in 1919. The plant produced huge amounts of war materials in World Wars I-II, under his supervision. He was a noted patron of art.

Ford, Henry (1863-), American automobile manufacturer, the son of an Irish immigrant, born on a Michigan farm, who became the principal individual personality of the world's industrial civilization, one of the richest of men in an era of giant fortunes, and the archetypal figure of mass production. He left school at 16 to learn the machinist trade, became a stationary engineer and in the early nineties was attracted by the idea of the 'horseless carriage.' He made one, a two-cylinder affair which annoyed his Detroit neighbors. But, as he expressed it, 'the darn thing ran.' It was the forerunner of millions of cheap automobiles which thronged the continents twenty years later.

Early in his career, Ford conceived the idea of producing a standardized car at a price low enough to attract the vast purchasing power of America's middle classes. The notion captured his generation and to meet the demand for his famous model-T (planetary transmission) his factories mushroomed into enormous proportions in the decade 1910-20. At the outset, his partners in the Ford Motor Company included James Couzens (later U. S.

Senator), Horace E. Dodge, John F. Dodge and John S. Gray. Years afterward, Ford bought back their original 5000 shares at fabulous prices, leaving him and his son, Edsel (1894-1943), sole owners of the billion dollar enterprise.

The parent Ford plant on the River Rouge, Detroit, and other assembling plants in the U. S., Canada and England, developed the moving-belt process of mass production by



Henry Ford.

which all the operations of car fabrication were effected along a single belt system until the finished automobile rolled down an incline ready to be driven away.

At its peak, his industry employed 200,000 or more men. He pioneered a \$5 a day minimum wage (1914), later raising the rate to \$7. Meanwhile, he developed a profit-sharing plan.

Besides making automobiles, Ford was a pioneer in commercial aviation, developing airplanes and landing fields.

Ford, Henry, II (1918-), son of Edsel Ford and grandson of Henry Ford, was born in Detroit. In 1945 he became President of the Ford Motor Co.

Ford, Henry Jones (1851-1925), American journalist. Editor of a number of daily newspapers; lecturer on political science at

Johns Hopkins University in 1906, and professor of politics at Princeton in 1908. His published works include *The Rise and Growth of American Politics* (1898); *The Cost of Our National Government* (1909); *The Natural History of the State* (1915); *Woodrow Wilson, a Biographical Study* (1916); *Washington and his Colleagues* (1918); *Alexander Hamilton* (1920); *Representative Government* (1923).

Ford, John (1885-c. 1639), English dramatist. His best works are *'Tis Pity She's a Whore* (1633), and *The Broken Heart* (1633). Other works are *The Lover's Melancholy* (1629); *Love's Sacrifice* (1633); *Perkin Warbeck* (1634).

Ford, John (Sean O'Feeney) (1895-), American director of motion pictures. He has received the Photoplay award (1928); N. Y. Critics Award, Foreign Press Club Award, Belgian Prix du Roi (all in 1935). He received the awards of Academy of Motion Picture Arts and Sciences for his direction of *The Informer* (1935) and *Grapes of Wrath* (1940). Others he has directed are: *Lightnin'* (1930); *Lost Patrol* (1935); *The Plough and the Stars* (1937); *Tobacco Road* (1941).

Ford, John Thomson (1829-94), theatrical manager, was manager of theatres in Richmond and Baltimore previous to his engaging in the same occupation in Washington, D. C. There he built three theatres, in one of which—the well-known 'Ford's Theatre'—President Lincoln was assassinated.

Ford, Paul Leicester (1865-1902), American historical writer and novelist. His historical and bibliographical work includes the *Webster Genealogy* and a *Bibliography and Reference List of the History and Literature Relating to the Adoption of the Constitution*. He edited the *Writings of Thomas Jefferson*, in 10 volumes (1892), and wrote *The True George Washington* (1896); *The Honorable Peter Sterling* (1894); *Janice Meredith* (1899). He was the founder and editor of the *Bibliographer*.

Ford, Worthington Chauncey (1858-1941), American author and statistician. In 1908 he became editor of the publications of the Massachusetts Historical Society, and in 1929 director of the European Mission of the Library of Congress. He published *George Washington* (1899); *Boston Book Market, 1679-1700* (1917). He also edited *The Writings of George Washington* (1889-91).

Fordham University, formerly Saint John's College, a Roman Catholic institution at Fordham, New York, and opened 1841.

In 1846, the New York Legislature granted it the right to give degrees in theology, arts, law and medicine. In 1907, by amendment of the college charter, the name was changed to Fordham University.

Fore-and-aft Rig, one in which the sail, of generally rectangular shape and with spars at top and bottom, hangs parallel to the mast, as in schooners.

Foreclosure, the legal proceeding by which a lien is enforced. Foreclosure suits are conducted in courts exercising equitable jurisdiction, and are subject to the rules of equity. The debt which the lien protects must be due and unpaid, and all persons having an interest in the property subject to the lien must be made parties to the action. This is the only relief asked against such defendants, but against the principal debtor a deficiency judgment may be claimed.

Forefather's Day, the anniversary of the landing of the Pilgrims at Plymouth, Mass., on Dec. 11 (Dec. 21, new style), 1620.

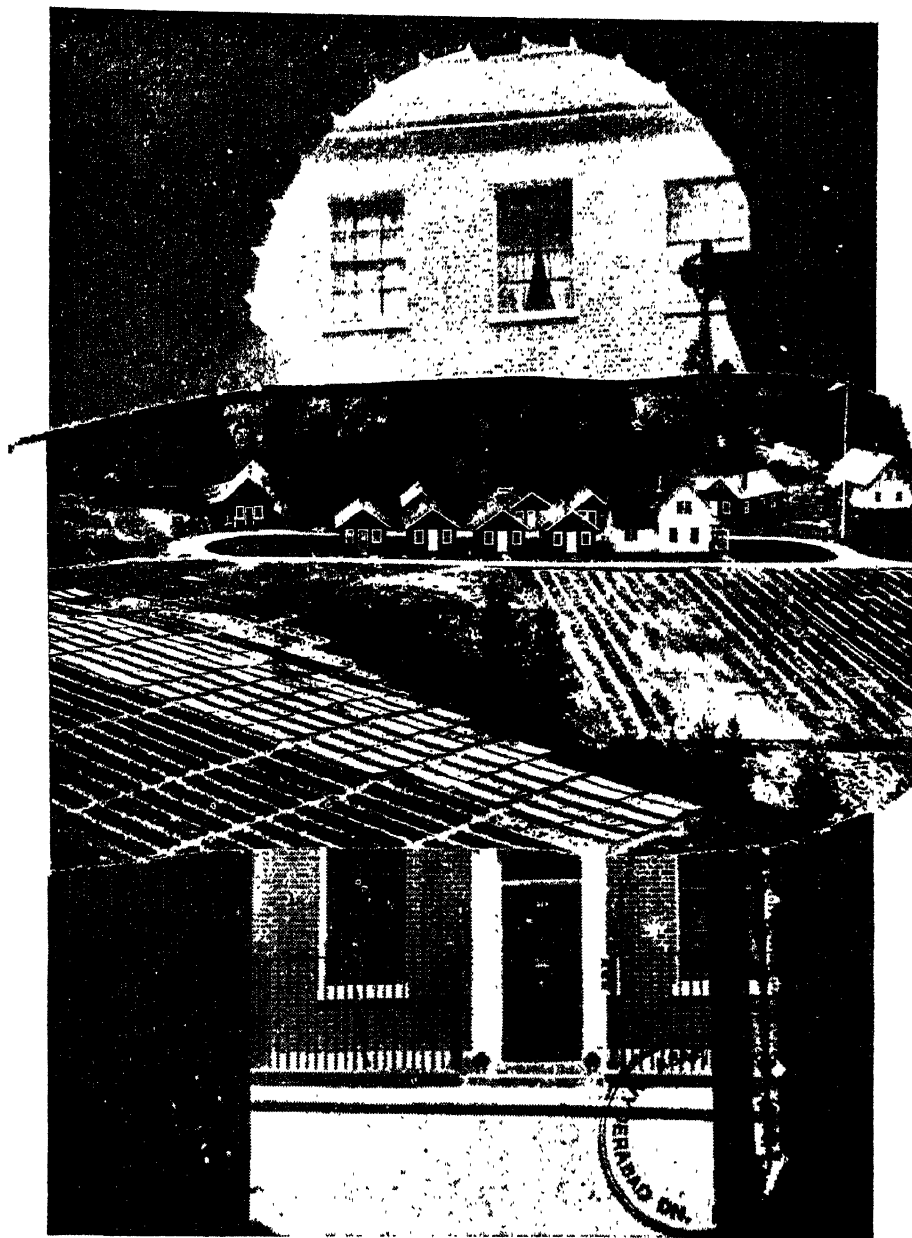
Foreigner. See **Alien**.

Foreign Law, from the point of view of the courts of one jurisdiction, signifies the law prevailing in any other jurisdiction. Thus the law of England is foreign to the courts of the United States, as likewise is the law of one State to the courts of another.

It is now the general rule, both in the United States and in England, that the judgment of a foreign court will be recognized and enforced, except where the court in question had no jurisdiction in the matter or was the victim of a fraud, or where the proceedings were tainted with corruption or gross irregularity. See Article IV. of the United States Constitution.

Foreign Legion (*Légion Etrangère*), a body of non-Frenchmen of all nationalities, recruited for the French service, organized at Toulon in 1831, and sent to assist in the conquest of Algeria. In the Great War (1914-18), this organization performed many deeds of surpassing valor.

Foreign Office, in Great Britain, that government department which carries on official intercourse with foreign states, controls the British diplomatic and consular services, and issues foreign office passports to natural born, and to naturalized British subjects. It has been a separate department since 1782. It has been housed in its present buildings in Downing Street only since 1868. The continuity of foreign policy is maintained by a permanent staff, at the head of which are a permanent under-secretary and three assistant under-



*British Prime Minister's Official Residence,
10 Downing Street, London.*

secretaries. The Secretary for Foreign Affairs is always a member of the Cabinet.

Foreign Wars of the United States, Military Order of, an American order composed of officers who served in the Revolutionary War, the War with Tripoli, the War of 1812, the Mexican War (1847), the War with Spain (1898), the China Relief Expedition (1900), the Nicaragua Campaign, the Vera Cruz Campaign, the Mexican Campaign (1916), and the World War with Germany (1917 and 1918); the lineal male descendants of such officers are admitted to membership. The order was instituted in New York City on Dec. 27, 1894, and was incorporated on Jan. 15, 1895. Its objects are 'to honor and perpetuate the names of brave and loyal men; to keep in mind the valor of their martial

dues, the Photoplay award (1928), N. Y. Arts Award, Foreign Press Club Award, Prix du Roi (all in 1935). He received the awards of Academy of Motion Picture Arts and Sciences for his direction of *The Informer* (1935) and *Grapes of Wrath* (1940). Others he has directed are: *Lightnin'* (1930); *Lost Patrol* (1935); *The Plough and the Stars* (1937); *Tobacco Road* (1941).

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Paul Leicester (1865-1902),

gain; to strengthen the ties of fellowship among the Companions of the Order; to foster the cultivation of Military and Naval Science; and to aid in maintaining National Honor, Union and Independence.' The National and State commanderies have a membership of over 6,000.

Foreland, North and South, two chalk headlands on the east coast of Kent, England, 16 m. apart, with the Downs and Goodwin Sands between. North Foreland has a lighthouse with light visible 20 m. South Foreland, has two lighthouses, visible respectively 23 and 26 m.

Foreshortening is the art of representing graphically upon a flat surface the relationship between different parts of the same object. By means of it the true appearance of objects of three dimensions can be suggested in drawings and pictures. In an absolute sense, foreshortening is a matter of drawing, and is attained by the correct placing and proportioning of the

nearer to the more remote parts. Foreshortening is subject to the laws of perspective, and is one of the severest tests of a draughtsman's skill. But while foreshortening is properly a question of draughtsmanship, it is in all pictorial representations not in pure outline supplemented and enhanced both in effect and truth by modelling, which represents the play of light on the surfaces and the difference of value caused by light and color.

Forestalling, the ancient offence of buying up goods on their way to market for the purpose of increasing their price to the consumers. The offence was abolished in 1844. In the United States this commonlaw offence is not recognized, but statutes against monopolies and trusts are intended indirectly to prevent the evil.

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Swiss cantons, Uri, Schwiz, Unterwalden, and Lucerne, that surround the Lake of Lucerne.

Foresters, Ancient Order of, a benevolent and fraternal organization claiming descent from a court of foresters established in 1745 at Knaresborough, England. The order was brought to America in 1832 by the formation of Court Good Speed in Philadelphia. The first court to survive was Court Brooklyn, founded in 1864.

Foresters, Independent Order of, a fraternal order, founded in 1874, with a membership in Great Britain, the United States, and Canada.

Foresters of America, a fraternal and benevolent association established in 1864. Membership is open to white males of sound health and good character between 18 and 50 years of age. The order was under the jurisdiction of the High Court of England until 1889, when it was reorganized as an independent order.

Forest Fires. Ever since forests have existed, forest fires have in all probability occurred. Forest fires may be due to natural causes, of which lightning is the chief, nearly 10 per cent. of all forest fires being of this origin; or to human agencies, in which case they may be traced to railroads, careless campers, brush burning, sawmills, or to incendiarism. Surface fires are those which spread over the surface of the forest floor and are fed by litter and undergrowth. These fires are fought by beating with blankets, gunny sacks, green boughs, etc., or

checked either by some natural obstacle, such as a stream, or by means of back firing.

Forest fires in the United States in the last fifty years have caused an average annual loss of from 50 to 70 lives, the destruction of at least \$25,000,000 worth of trees, to say nothing of the loss of crops, stock, and buildings amounting to many more millions, to which must be added also the damage to young trees, the deterioration of the soil, the injury to adjacent property, and the resulting interruption of business. In the last thirty years there has



Photo by U. S. Forest Service.

Savenac Forest Nursery, Lolo National Forest, Montana.

Here the Government has no less than 9,000,000 small seedling trees which are to be set upon denuded lands in the forest.

by throwing water or dirt on the flames. Sometimes a furrow is ploughed as an emergency fire line. Ground fires smoulder or burn only in the ground, consuming the humus and duff and often injuring the roots of trees. When the vegetable mold is not too deep, water and sand will generally quench ground fires, but if the mold is deep, it may be necessary to dig a trench down to the mineral soil. Crown fires consume the entire forest cover, starting from surface or ground fires, or ignition of the tops of the trees by lightning. They are usually

been a notable arousing of public sentiment in regard to forest fire prevention and much beneficial legislation has been enacted. Most of the States have efficient laws in regard to the prevention and control of forest fires, and the National Forests have a highly organized and efficient system of fire protection and control which is effected by means of patrols and look-outs, the maintenance of trails and telephone lines through the forests, and the careful preparation each season for a rapid mobilization of fire-fighting forces.

Forest Law. The early Norman kings of England, in order to indulge their passion for hunting, declared the greater part of the unenclosed woodland of the realm to be the king's forest, and made stringent laws prohibiting all persons from hunting, destroying trees or shrubbery, or committing any acts in such areas which would render the country less desirable for game and hunting. The early statutes punished the breaking of forest laws with death, putting out the eyes, etc., according to the nature of the offence. Modern statutes have reduced them to the plane of ordinary laws for the protection of property, with reasonable penalties for violation. Laws to promote forest conservation have been adopted by nearly all civilized nations. See FORESTRY.

Forest Marble, a subdivision of the Oolitic rocks of the west of England, consisting of beds of clay, sandstone, and oolitic limestone. In some places it yields a shelly, fissile limestone, which has been cut and polished as an ornamental stone.

Forestry is the administration of forest land with a view to the continuous production of trees, the aim being to secure the largest possible service from the forest. The timber and other products are utilized, but when the timber is cut it is replaced and the land kept in a productive condition, forestry differing thus from ordinary lumbering which merely removes the merchantable timber with no effort to perpetuate the forest, and often by methods that leave the land unproductive and even waste. Forestry aims further to secure returns every year or at short intervals by control of the cuttings.

The branch of forestry dealing with the reproduction of the forest, and the improvement of forests by thinning or other cultural methods is called *Silviculture*. *Forest Protection* includes the measures used in protecting forests from fires, insect depredations, fungous diseases, and other injurious agencies. The loss from these agencies is about \$200,000,000 annually. The methods of measuring standing timber and logs for the appraisal of their volume and value, of determining the rate of growth of trees and calculating future yield, and similar matters are included under the head of *Forest Mensuration*. *Forest Utilization* comprises the logging, manufacture, and uses of the products of the forest. Forestry is peculiarly a public problem, not only because the forests render an important service to the public in conserving water resources, protecting mountain slopes, providing public recreation grounds and in other ways, but because

the problem is such that the participation of the public is required even in connection with private lands. Thus it is only through public action that an adequate system of protection from fires can be obtained; the public must, furthermore, aid private owners by providing an equitable system of taxation, and by demonstrating to them the best methods of silviculture. In some instances the public needs can not be left wholly to private owners, and the nation or state must acquire and administer the land. Much has been accomplished in the way of public forestry within the last thirty five years. The first forward step was taken when the Federal Government inaugurated a policy of setting aside portions of the public domain as permanent reservations to be handled in the interest of the whole nation.

The Federal reservations are called National Forests, and comprised about 162,009,145 acres of land, located chiefly in the mountains of the Far West and Southeastern Alaska. There are, also, small National Forests in a number of the Eastern States, most of these having been acquired under the Weeks Law providing for the purchase of private forest lands in the White Mountains and the Southern Appalachians. The National Forests were set aside as public properties to be used and developed in the permanent interest of the whole nation, and are to-day rendering this service. They are under the administration of the Forest Service of the Department of Agriculture. In addition to the task of handling the Federal forests, the Forest Service is charged with promoting forestry throughout the country. This it does through well organized research work conducted at local field stations, through public education, and through co-operation with the States and private agencies. Largely under the stimulus and leadership of the Federal undertaking various of the States have established central agencies charged with the forest interests within their borders. There is now a body of professional foresters in the United States, and excellent instruction in Forestry is offered at the leading colleges. Under the Roosevelt administration in 1933, the Civilian Conservation Corps was created as a relief measure, and placed in charge of forest work. Some 325,000 men were distributed over the country, on public and private forest lands, in camps of about 200 men each. The work of this vast project has its effect not in immediate forestry service but in the ultimate result of affecting the curricula of forestry schools, making them more practical in content. A long time project of tree

planting in the great drought areas of the middle west is expected not only to relieve drought conditions but to check soil erosion.

Consult the publications of the U. S. Forest Service; *Reports and Circulars* of the State Foresters; *American Forestry Magazine*; *Journal of American Foresters*; Ise's *The United States Forest Policy* (1920); R. C. Hawley's *Practice of Silviculture* (1921); Ahern's *Forestry Bankruptcy in America* (1933); Bailey and Spoehr's *Role of Research in the Development of Forestry in North America* (1929); *The Forest Service*, Brookings Institution Monograph (Washington, D. C., 1930); Graham's *Principles of Forest Entomology* (1929).

Forestry Association, American, an organization formed in 1882 and incorporated in 1897, for the promotion of the wise use and conservation of forests; it publishes an official organ, *American Forestry*. Offices are maintained in Washington, D. C.

Forests. As ordinarily used the term forest is applied to an area well stocked with trees. Technically a forest has a greater significance than a mere aggregation of trees. A forest is a community of individuals each struggling for space, light, and nourishment, and each reacting on its neighbors in various ways. The forest *primaevae* represents the ultimate product of undisturbed natural forces. In such a forest one finds trees of all ages and sizes mingling more or less promiscuously. Individual trees mature, die, and make way for others. The amount of growth each year is about offset by decay. It is seldom, however, that extensive areas of forests escape the action of destructive agencies. Unusual wind storms, fires, set by lightning, and insects frequently wipe out whole stands. Nature tends to repair such devastation, but with the advent of man comes a new destructive agency.

The distribution of forests is governed largely by moisture and temperature. Regions with sufficient moisture were originally covered with practically unbroken forests, such openings as occurred being due to local conditions of soil and to such destructive agencies as fire, wind, and insect depredations. There is great variation in the character of the forests growing under different conditions of climate and soil, forests differing in component species, in size of timber, form of stand, quality and yield of products, and other particulars. Thus, in the northern countries—Northern Canada and portions of the Northern United States, Alaska, Siberia, Northern Russia, Finland, and Scandinavia—there is a broad belt of forests with a predominance of coniferous trees. In the great

temperate belt forests are composed of mixed hardwoods and conifers, either predominating as the local conditions are especially favorable for their growth. In the tropics, wherever the rainfall is heavy, the hardwoods grow in great variety and profusion.

The United States is naturally endowed with forests unexcelled anywhere, the wide climatic range furnishing unusually favorable conditions for tree growth. Altogether the original forests covered about 825,000,000 acres, in addition to about 125,000,000 acres of open woodland. There are no less than five hundred arborescent species. The greatest single factor in the economic importance of the forests is the presence of a large amount of coniferous timber favorably located with reference to the needs of the population and industries. About three quarters of the merchantable timber of the United States standing to-day consists of coniferous or so-called soft wood species.

There is land enough in the United States not suitable for other purposes, to produce by growth more than enough timber to meet the requirements of the Country. The lack of adequate fire protection and failure to use the proper methods of forestry result in a continued deficiency as between consumption and production by growth.

In recent years much attention has been given to the development and conservation of forests. The government has set aside vast tracts of land known as National Forest Preserves and has undertaken huge projects of planting new forests especially in sections of deficient drainage and deficient rainfall. See FORESTRY.

Forfar, county town and royal burgh, Scotland. Forfar Loch lies west of the town and near by is Kirriemuir, the 'Thrums' of Barrie's tales. The site of the old castle demolished by Bruce in 1308 is marked by a town cross. Linen and jute are manufactured, and bleaching, tanning, iron founding, and the making of confectionary are of importance; p. 9,585.

Forfeiture, in law, is the loss of an owner's rights in property without compensation, as a penalty for violation of a particular law. In the United States, both the Federal Government and the various States have statutory provisions prescribing forfeiture of chattels for certain violations of the law. In all the States, instruments of crime and articles, the sale of which is prohibited, are forfeited to the State, if found unlawfully in the possession of a person within its boundaries.

Forgery, the fraudulent making or altering of a written or printed document with the in-

tention of deceiving one or more persons into believing it to be genuine to their damage. If a genuine instrument is altered so as to materially change its effect, either by erasure or addition of words, this is sufficient to constitute the offence, if done with the intent to defraud. If a person 'utters' or uses a forged instrument knowing it to be such, he is guilty of the offence. By statute in all States forgery is punishable by imprisonment.

Forget-me-not, the name applied to the various members of the genus. *Myosotis*, which is of wide geographic distribution. They are low growing herbs, diffuse or erect, and peren-

Forging, the working into special shape of iron or steel when it is at white heat, and therefore, in a malleable state. It may be done by hammers, operated by hand or power or by the use of the hydraulic press. See STEAM AND PNEUMATIC HAMMERS; HYDRAULIC MACHINERY.

Fork, an instrument made from various substances—usually metal—terminating in two or more elongated points called prongs. The use of the fork as a table adjunct seems to have originated in Italy, whence it was carried to England, though its use there did not become well established before the end of the 17th cen-



Photo by U. S. Forest Service.

A System of Clear-Cutting Leaving Scattered Seed Trees.

This method is practised in the pine forests of Minnesota. The reproduction will be secured from these trees.

nial or annual. The leaves are alternate with entire margins and the flowers, a beautiful blue in color, with a five-cleft calyx and a salver-shaped corolla. The True Forget-me-not is a fairly common European plant and has become naturalized in the United States, where it may be found in brooks and other damp places from Maine to Pennsylvania. Other species are the Smaller Forget-me-not, and the Alpine Forget-me-not, a compact little rock-plant, which is covered with blue flowers in spring. Forget-me-nots are known also as Scorpion Grass.

tury. The term fork is applied also to a pronged agricultural implement used for tossing, carrying or lifting, as a pitchfork or hay fork; and to a small percussion instrument used to measure the pitch of musical tones. See TUNING FORK.

Forli, town and episcopal see of Italy, stands at the north foot of the Apennines. Among the places of interest are the church of San Mercuriale, the Palace del Municipio, the Cathedral of Santo Croce, rebuilt since 1844, and the Ginnasio Comunale, which contains the municipal art collections. The Citadel,

exhibited. For symbols, etc., see CHEMISTRY. In Mathematics, Physics, and Engineering, formula is the statement, by means of algebraic symbols, of a rule, principle, or phenomenon. Among innumerable examples is the formula for finding the area of a circle.

Fornax (Chemica), a small southern constellation formed by Lacaille in 1752. It lies in a bend of Eridanus, to the east of Sculptor.

Forney, John Weiss (1817-81), American journalist, was born in Lancaster, Pa. He became editor and joint proprietor of the Lancaster *Intelligencer*, and in 1840 gained control of the Lancaster *Journal*. In 1845 he was appointed deputy surveyor of the port of Philadelphia, and edited *The Pennsylvanian* from 1846 to 1851, when he attained national importance leading to editorship of the Washington *Union*. He was Democratic candidate for U. S. Senator from Pennsylvania in 1857, and in the same year founded the Philadelphia *Press*. He joined the Republican Party; was re-appointed clerk of the House in 1859; and in 1860 established the Washington *Sunday Morning Chronicle*, which he afterward changed to a daily, and edited until 1870. From 1861 to 1868 he was secretary of the U. S. Senate; was a consistent supporter of Lincoln; and worked for Andrew Johnson's impeachment. Among his works are: *Anecdotes of Public Men* (1873); *Forty Years of American Journalism* (1877).

Forres, town, Elgin county, Scotland. Sweno's stone, an ancient obelisk, lies near; p. about 4,421.

Forrest, Edwin (1806-72), first great American actor, was born in Philadelphia. Edwin did bits in theatres from ten on; in 1822 he went West with a travelling company—Pittsburgh, Lexington (Ky.), Cincinnati—a typical 'barnstormer'. He acted in the best—Shakespeare, Jonson, Otway, Georgian drama; saw and shared much violent, unshackled life; and lived a while with a Choctaw chief. Returning at nineteen, Forrest took a man's post in Albany in the 14th century, as now used as a prison. Forli is said to have been founded in 188 B.C. by Livius Salinator; p. 24,700.

Form, in music, is the name given to the general plan upon which a composition is constructed. Each species of musical composition contains certain distinctive features which constitute its *form*. Among important determining factors may be mentioned the order of succession of various movements; the predominating characteristics of these movements; and the distribution of subjects and their key relationship. See Music.

a social lion; and married the daughter of John Sinclair the singer. A world-noted divorce suit parted them in 1850-2. A second English visit (1845-6) was a calamity. He was hissed from London; thought it Macready's work; and openly hissed the latter in revenge, thereby losing English good will. In 1848 Macready came to America; Forrest's New York partisans broke up the closing performance in 1849, and 22 were killed and 30 wounded by a military volley. From 1853 to 1890 Forrest retired; in 1895 he was partially paralyzed, and never recovered; and a new world of dramatic fashions and actors left him a survival, though he kept the stage till 1872, making a fortune which established Fonthill, his Castle on the Hudson, and the Edwin Forrest Home for aged and destitute actors near Philadelphia. Consult *Lives* by Alger and Barrett.

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Formaldehyde, (HCHO), a colorless gas. Commercially, formaldehyde is sold in solutions of 40 per cent. strength, called *Formalin* or *Formol*. Formalin is a colorless fluid of pungent odor and caustic taste, whose vapor or solution is a powerful irritant to the skin or mucous surfaces. It is a poison, and is used as a germicide and fungicide on plants and vegetables. In a 2 per cent. solution, spray, or vapor it is useful for disinfecting rooms, clothing, and instruments. Although equally good as a preservative of foodstuffs, its use for such purposes is prohibited.

tention of deceiving one or more persons into believing it to be genuine to their damage. If a genuine instrument is altered so as to materially change its effect, either by erasure or addition of words, this is sufficient to constitute the offence, if done with the intent to defraud. If a person 'utters' or uses a forged instrument knowing it to be such, he is guilty of the offence. By statute in all States forgery is punishable by imprisonment.

Forget-me-not, the name applied to the various members of the genus. *Myosotis*, which is of wide geographic distribution. They are low growing herbs, diffuse or erect, and peren-

Forging, the working into special shape of iron or steel when it is at white heat, and therefore, in a malleable state. It may be done by hammers, operated by hand or power or by the use of the hydraulic press. See STEAM AND PNEUMATIC HAMMERS; HYDRAULIC MACHINERY.

Fork, an instrument made from various substances—usually metal—terminating in two or more elongated points called prongs. The use of the fork as a table adjunct seems to have originated in Italy, whence it was carried to England, though its use there did not become well established before the end of the 17th cen-

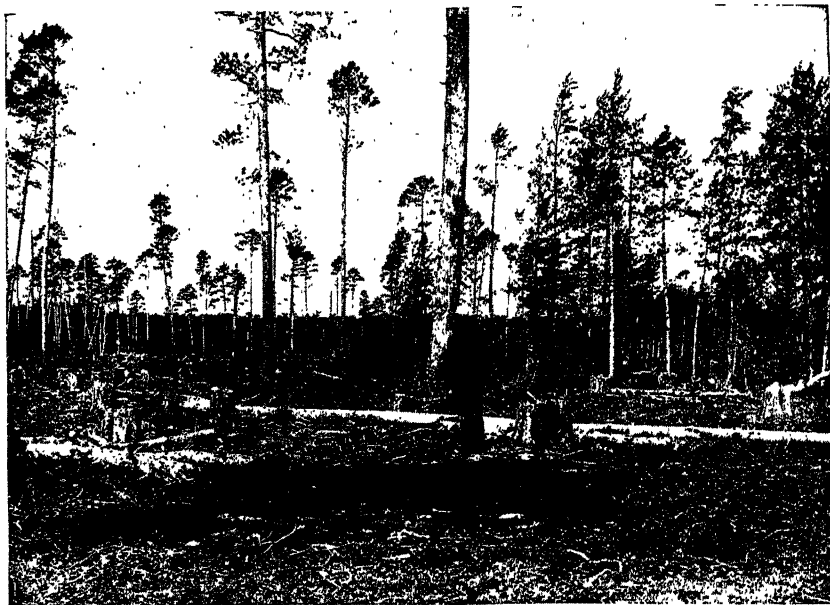


Photo by U. S. Forest Service.

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in Mount Morrison (14,270 ft.), renamed by the Japanese Niitakayama, and Mount Sylvia or Set-su-zan (12,480 ft.). From the western foothills a broad stretch of lowland, watered by a number of short streams, extends to the coast. Eastward the mountains continue to the shore, where magnificent cliffs rise sheer from the water to heights of from 3,000 to 5,000 ft. The climate, on the whole, is damp, hot, and malarious. The soil is exceedingly fertile, and vegetation is luxuriant. The fauna is allied to that of Japan, and includes the deer, wild boar, bear, monkey, wild cat, civet,

the capital, on the River Paraguay, is the only settlement of importance.

Formosus, Pope (c. 816-896), was probably born in Rome, and was nominated bishop of Porto in 864. Stephen VI. denounced him as a usurper, and declared all his acts and measures void; but his pontificate was pronounced valid by a council presided over by John IX. in 898.

Formula. In Chemistry, formulas express concisely the composition of compounds, and are of different kinds, according to the degree of explicitness with which the constitution is

exhibited. For symbols, etc., see CHEMISTRY. In Mathematics, Physics, and Engineering, formula is the statement, by means of algebraic symbols, of a rule, principle, or phenomenon. Among innumerable examples is the formula for finding the area of a circle.

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An ardent patriot, Forrest resented the American stage being parasitic to the English; and mindful of his Choctaw friend, brought out the famous *Melamora*, still remembered by burlesqued tags. In 1836-7 he played at Drury Lane, London, with great success; was

a social lion; and married the daughter of John Sinclair the singer. A world-noted divorce suit parted them in 1850-2. A second English visit (1845-6) was a calamity. He was hissed from London; thought it Macready's work; and openly hissed the latter in revenge, thereby losing English good will. In 1848 Macready came to America; Forrest's New York partisans broke up the closing performance in 1849, and 22 were killed and 36 wounded by a military volley. From 1853 to 1890 Forrest retired; in 1865 he was partially paralyzed, and never recovered; and a new world of dramatic fashions and actors left him a survival, though he kept the stage till 1872, making a fortune which established Fonthill, his Castle on the Hudson, and the Edwin Forrest Home for aged and destitute actors near Philadelphia. Consult *Lives* by Alger and Barrett.

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rest is said to have been the guiding spirit of the Ku-klux Klan.

Forster, Edward Morgan (1879-), English novelist, author of *Howard's End* (1910) and *A Passage to India* (1924).

Förster, Ernst Joachim (1800-85), German painter and author, brother of Friedrich Förster, was born near Kamburg, on the Saale. In association with Cornelius he prepared some very fine frescoes in Bonn and Munich. Travelling in Italy, he not only gathered materials for his great work, *Beiträge zur Neuern Kunstgeschichte* (1836), but was the means of discovering some long-hidden frescoes in the Chapel of St. George at Padua. He then largely relinquished the practice of art, and became its historian and literary exponent. His chief works are: *Geschichte der Deutschen Kunst*; *Geschichte der Italienischen Kunst*; *Denkmale Italienischer Malerei*. He also wrote biographies of J. G. Müller, *Fra Angelico*, *Raphael*, and *Cornelius*; translated, with Schorn, Vasari's *Lives of the Painters*, and edited the posthumous works of his father-in-law, Jean Paul Richter, whose *Life* he also wrote.

Förster, Friedrich Christoph (1791-1868), German historian, brother of Ernst J. Förster. For a time he was professor of military engineering in Berlin, but lost his chair owing to his liberal views on politics. He was appointed (1829) chief custodian of the Royal Museum at Berlin. His chief works are: *Friedrich der Grosse, Jugendjahre, Bildung und Geist* (1822), to which Carlyle owed much; *Albrecht von Wallenstein* (1834); *Geschichte Friedrich Wilhelms I.* (1835); *Die höfe und Kabinette Europas im 18 Jahrhundert* (1836-39). He also wrote popular historical works on Prussia, edited an edition of Hegel, and wrote several poems and dramas.

Forster, Johann Reinhold (1729-98), German naturalist and traveller, was born in Dirschau, Prussia. He accompanied Captain Cook in his second voyage (1772) as naturalist and scientific observer. On his return he published in collaboration with his son, J. G. A. Forster, *Observations Made During a Voyage Round the World* (1778).

Forster, John (1812-76), English biographer, essayist, and historian, was born in Newcastle. He wrote for *The Edinburgh Review* in 1845; succeeded Dickens as editor of *The Daily News* in 1846; and edited *The Examiner* from 1847 to 1856. He was the author of many admirable biographical and historical essays, besides the following works: *The Life and Adventures of Oliver Goldsmith* (1848; new ed. 1854); *Arrest of the Five Members* (1860); *De-*

bates on the Grand Remonstrance (1860); edited Landor's *Imaginary Conversations* (1864), and published a *Life of Landon* (2 vols., 1869); and wrote the valuable *Life of Dickens* (3 vols., 1872-4). He left an unfinished *Life of Swift* (vol. i., 1876). Consult R. Renton's *John Forster and His Friendships* (1913).

Forster, William Edward (1818-86), English statesman, born at Bradpole, Dorsetshire, the son of William Forster, a Quaker missionary. From 1861 until his death he represented Bradford in the British Parliament, and was one of the advanced Liberal leaders. During the American Civil War he opposed all attempts to recognize the Confederate States. He entered the Gladstone Cabinet in 1870, and the same year introduced the greatest legislative measure associated with his name, the Elementary Education Bill. In the Gladstone administration of 1880 Forster accepted the office of chief secretary for Ireland. An agrarian and political agitation was then disturbing a large portion of Ireland. Forster was attacked unceasingly in Parliament by the Irish members, and his life was threatened by the 'Invincibles.'

Forsyth, George Alexander (1837-1915), American soldier, was born in Moncy, Pa. He fought during the entire Civil War in the Army of the Potomac. He then entered the regular army (1866), becoming a major in the Ninth Cavalry. One of his most thrilling exploits was at the battle of Arickaree Fork (September, 1867), when with 50 men he held off a force of 700 Cheyenne warriors for nine days, till relief arrived. For this exploit he was brevetted brigadier-general.

Forsyth, James William (1836-1906), American soldier, was born in Ohio. He was chief of staff to Major-General Sheridan (1864-5), attaining the rank of brigadier-general of volunteers and brevet of the same rank in the regular service. He became colonel of the Seventh Cavalry in 1886, and brigadier-general in 1894, and was retired with the rank of major-general in 1897.

Forsyth, John (1780-1841), American public official, was born in Fredericksburg, Va. He became attorney-general of the State in 1808, Member of Congress in 1813, and U. S. Senator in 1818. In 1819-22 he was minister to Spain and negotiated the treaty whereby Florida was ceded to the United States. He was again a member of Congress in 1823-7, and was enacted champion of the governor of Georgia in his dispute with the National Government over the removal from that State of the Creek and Cherokee Indians. In 1827 he

was elected governor of Georgia, and in 1829 was again sent to the U. S. Senate. He was made Secretary of State by Jackson 1834, and retained that office through Van Buren's administration (1836-40).

Forsythia, a genus of hardy, deciduous shrubs of the order Oleaceae. The flowers are yellow.

Fort, John Franklin (1852-1920), American jurist and public official, was born in Pemberton, N. J. He was judge of the district court in Newark, N. J. (1879-86); presiding judge of the Essex co. court of common pleas (1896-1900); and justice of the supreme court of New Jersey (1900-09). From 1908 to 1911 he was governor of New Jersey. He acted as the representative of the President of the United States in the reconstitution of the government of Santo Domingo in 1914, and of Haiti in 1915.

Fort Ann, village and summer resort, New York, Washington co. A fortified camp was established at this point in 1690 by Fitz John Winthrop. Colonel Nicholson erected a fort on the site in 1709, which was rebuilt in 1797 as Fort Ann. It was the scene of a battle in the French and Indian War, and was occupied and partially destroyed by the British in the American Revolution.

Fort Bowyer, formerly a fort on Mobile Point, at the entrance to Mobile Bay. It was built in 1813 by General Wilkinson, and with a garrison of 160 men under Major William Lawrence successfully resisted the British forces under Captain Percy in September, 1814. It fell on Feb. 11, 1815, after the Battle of New Orleans.

Fort Chippewyan, situated opposite the mouth of the Athabasca River, at the south-west end of the lake of the same name, is a trading post of the Hudson's Bay Company.

Fort Churchill, trading station of the Hudson's Bay Company at the mouth of the Churchill River, where it enters Hudson Bay.

Fort Clark, a U. S. military post on Las Moras Creek, near Brackettville, Tex. It helps guard the San Antonio and Eagle Pass road and the Mexican border. See FORTS.

Fort Collins, city, Colorado, county seat of Larimer co., beautifully situated four miles from the foothills of the Rocky Mountains at an altitude of 4,990 ft., is one of the main gateways to Estes Park and Poudre Cañon; it is the centre of a rich agricultural and stock-raising region; it is also the seat of the Colorado Agricultural College and the headquarters of the Colorado National Forest; p. 12,251.

Fort Dodge, city, Iowa, county seat of Webster co., on the Des Moines River. It is an im-

portant manufacturing town; near by gypsum, building stone and coal are mined; p. 22,904.

Fort Edward, village, New York, Washington co., has paper and pulp mills, shirt factories, and pottery works; p. 3,871. The present village was founded on the site of a fort built by Gen. Phineas Lyman in 1755, and first known as Fort Lyman, but afterward named in honor of one of the grandsons of George II. The fort was important during the French and Indian War. It was the headquarters of Gen. Philip Schuyler during part of the campaign against Burgoyne in the American Revolution. Jane McCrea was killed by the Indians not far from Fort Edward.

Fort Erie, town, Ontario, Canada, Welland co.; p. 1,546. The town is situated on the site of Fort Erie, which was the scene of severe fighting during the War of 1812. It was captured by an American force of 170 men under Gen. Jacob Brown on July 3, 1813; and in 1814, after the Battle of Lundy's Lane, it was occupied by 2,000 American troops, who completed the fortifications.

Fortescue, Chichester Samuel, afterward **Parkinson, Baron Carlingford**, and **Baron Clermont** (1823-98), British statesman, under Lord John Russell became Chief Secretary for Ireland (1865), an office he continued to hold in Gladstone's first administration (1868).

Fortescue, Sir John (c. 1394-c. 1476), English judge, was born in Somersetshire, and became (1442) lord chief justice of England in the reign of Henry VI. He accompanied Margaret of Anjou and her young son, Prince Edward, on their flight into Scotland, and in 1463 he embarked with the Queen and her son for Holland. During his exile he wrote his celebrated work, *De Laudibus Legum Anglie* (printed 1537). His *Governance of England*, written in English, was not published till 1714.

Fort Fairfield, town, Aroostook co., Maine. It is the site of an old fort. The surrounding country produces large quantities of potatoes; p. 2,693.

Forth, river and estuary of Eastern Scotland. The river is formed by two head streams—Duchray Water and Avondhu—both rising on Ben Lomond in Stirlingshire, and uniting, after courses of 12 and 10 m. respectively, near Aberfoyle. From there the Forth winds through the Central Lowlands for 39 m. to Stirling, below which it follows a still more tortuous course (the Links of Forth) for 12 m. to Alloa. The *Firth of Forth*, as the estuary is known, extends from Alloa to the North Sea, a distance of 51 m., between Clackmannanshire

and Fifeshire on the north, and Stirlingshire and the Lothians on the south.

Fort Hamilton, a U. S. military post, one of the defences of the southern entrance to New York Harbor, is situated on the southwestern end of Long Island, opposite Fort Wadsworth, at the Narrows.

Fort Hancock, U. S. military post, situated at the extremity of Sandy Hook, N. J., commands the seaward approaches to Lower New York Bay.

Fortification, in military engineering, is the art of strengthening military positions against attack. Protection may be given by a wall or earthen parapet thick enough to keep out projectiles, by concealment, or by advanced works constructed well out in front of the main position. Obstacles may be wet or dry ditches, or some form of entanglement or palisade. The design of any fortification is determined by many considerations, as the nature of the ground, the materials available for construction, the weapons in use, and the strategic possibilities of the site. Fortification is properly divided into two branches: Permanent fortifications are works constructed at leisure, generally in time of peace and of enduring materials; field fortifications are works extemporized by troops in the field, of materials found on the site. As the application of field fortification is comparatively recent, the history of fortification is mainly that of permanent fortification. The origin of such works antedates authentic history, their general character varying from age to age. For convenience their history may be divided into four periods.

1. From earliest time to the employment of cannon, about 1500 A.D., the type of fortification adopted was a thick stone wall with towers at intervals along its length and at the corners, and a path along the top on which the defenders stood to repel assaults. A light stone wall or battlement protected this boulevard. Walls of this character often enclosed an entire city or a large tract of country. The assailant endeavored to capture the fortification through breaching the wall by battering and undermining, or through driving the defenders from the battlements by means of movable towers, and scaling.

2. From 1500 to 1815 A.D. The invention of cast-iron shot, about 1480, did away with the overwhelming superiority possessed up to that time by the defence over the attack; and in the Italian campaigns of Charles VIII. of France (1494), fortified places fell rapidly before his large and powerful artillery. The dis-

integrating effect of the new projectile on stone soon led to the use of earth as a front covering to the masonry. The high, steep wall having been abolished, some other obstacle to the advance of the assailant became necessary. This was provided by a wet or dry ditch, twenty or more feet in width and of varying depth. The exterior wall of the parapet now served as the interior retaining wall of the ditch, or scarp wall. The exterior wall of the ditch, or counterscarp, was also revetted with masonry. No more than one-third of the parapet was exposed above the surface of the ground, and this was further protected and concealed from distant view by a mound of earth, called the *glacis*, thrown up just outside the ditch. The parapet, thus concealed, could be breached only by guns established on the glacis itself and within two hundred yards of the wall. The bottom of the ditch was defended by fire from subterranean galleries constructed inside the scarp and counterscarp walls.

The necessity of securing greater defensive fire and of bringing fire to bear on the ditch led to modifications of the trace or ground plan of the works, and there resulted two systems of fortification—the *bastioned*, which accomplished the sweeping of the ditches by fire from adjoining faces of the work itself, and the *polygonal*, which secured this fire by means of *caponiers*, or small galleries, constructed across the ditch in the centre of each face. The Latin nations of Europe generally adopted the bastioned system during this period, while near its close the Germanic nations adopted the polygonal system.

3. From 1815-1871 A.D. To the end of the Napoleonic Wars, every fortress had been surrounded by a continuous line of fortification, or *enceinte*. In order to keep the guns of the besiegers far enough away to prevent breaching, a girdle of detached forts was constructed about a mile in advance of the *enceinte*, and at such intervals as to allow of mutual support with flanking fire.

4. Since 1871. The Siege of Paris particularly illustrated the uselessness of existing designs. The detached forts were not far enough out to protect Paris from bombardment, and their commanding ramparts made conspicuous targets for the German gunners. The general trend of fortification design since the introduction of rifled guns has been toward the reduction of the large detached fort to the smallest possible infantry redoubt or supporting point, the improvement of cover by means of iron cupolas for the guns and concrete bombproofs, the abandonment of deep ditches

as obstacles to assault, and the reduction of command. The modern European fortress, entrenched camp, or fortified camp, as it is variously called, consists of a girdle of redoubts at a distance of from four to six miles from the edge of the defended place, and at intervals of from one to two and one-half miles, according to the nature of the country. These redoubts form a defensive screen behind which an army may encamp reasonably secure from danger of assault. For the transport and distribution of the great amount of ammunition and other stores required in the defence, all parts of the line are connected by trench railways, good roads, and telephone and telegraph.

The extensive use of aircraft for observing the effect and accuracy of artillery fire, and for locating trenches and artillery positions, has made concealment of prime importance. The most modern permanent fortification approximates very closely to strengthened field fortification. The obstacle to advance is the weapon, not the parapet and ditch.

An attacking line that is unable to advance further may hold on by digging in, despite the superior fire of the defence, until the arrival of reinforcements; or a general, by entrenching may hold one part of his line with inferior forces, while he secretly concentrates the bulk of his command for a decisive attack at some other part. Field fortifications were first used extensively during the American Civil War, although there are instances of their employment in previous wars. Since that time their use has steadily increased, until now the soldier's entrenching tool is considered secondary only to his arms and ammunition.

Probably the strongest fortifications the world had ever seen were the Maginot and Siegfried lines on the opposite sides of the French and German border, respectively. The former, built by France over a period of several years, from 1927-1938, was a solid line, and the latter, which the Nazis completed in 18 months, in 1938-9, was a tremendous system of forts and barriers of all kinds, connected by subterranean passageways. At places the lines were 15 to 20 miles in depth and their works, extending far underground, contained buried airplane hangars and repair shops, elaborate electrically-operated transportation systems, and quarters for millions of fighting men. Both lines were defended by some of the largest cannon ever built. As the European War of 1939 opened military experts were almost unanimous that neither Line could be reduced by sudden attack. It was believed that it

would take months for either nation to break through the opposing system and then, only after a terrific sacrifice of lives and materials. Both French and German leaders seemed to hold that opinion for in the first seven months of the war, neither assaulted the enemy line. However, in May, 1940, the Nazi armies assaulted the Netherlands, Belgium, Luxembourg, and France simultaneously. They avoided the Maginot line but in a few weeks were behind it and the French surrendered.

United States.—In this country the earliest fortifications were those built by the colonists for protection against the Indians, consisting generally of a rude stockade always kept in readiness for a siege, and into which all inhabitants were gathered at the first alarm. The Indian and Colonial wars developed more pretentious forts, many of them on the present sites of large cities. During the Revolutionary War strong fortifications were built at strategic places, and some of these are still in existence.

In 1816, pursuant to an act of Congress, a board of engineer and navy officers began a systematic study of the defence of the country. The general policy, as stated by the board, was:

(1) The means of defence consists of (a) the Navy, (b) fortifications, (c) interior communications by land and water, and (d) a regular army and well-organized militia.

(2) Fortifications must close all important harbors against an enemy, and secure them to the nation's military and commercial marine.

(3) They must deprive the enemy of all strong positions, where, protected by naval superiority, he may fix permanent quarters in any territory and keep the whole frontier in perpetual alarm.

(4) They must cover the great cities from attack.

(5) They must prevent, as far as practicable, the great avenues of interior navigation from being blockaded near the entrances to the ocean.

(6) They must cover the coast-wise and interior navigation by closing the harbors and several inlets from the sea which intersect the lines of communication, and thereby further aid the Navy in protecting the navigation of the country.

(7) They must protect the great naval establishments.

Under the project of this board were built, among many others, such well-known forts as Fort Monroe, Va., Fort Adams, R. I., Fort Moultrie, S. C., and Fort Pickens, Fla. These

were kept in a good state of preservation until after the close of the Civil War, but they became obsolete with the introduction of steel ships and the development of high-power rifled guns afloat. The policies of defence laid down by the fortifications board of 1816 are in general those being followed to-day, and the fortifications built under its project have exercised no little influence upon the history of the country. Other boards have since investigated and improved fortifications; as the Gun Foundry Board (1883); The Endicott Board (1886). Congress from time to time authorized departures from the original scheme, which, however, forms the basis of our present system of fortification. In February, 1915, a board was created in the War Department known as the Board of Review, to be a continuing board to pass on all matters relating to the deviation, extension, or improvement of existing or projected fortifications. The developments of war material brought out by the Great War of Europe necessitated a revision and extension of many of the coast fortifications. Consult Fiebeger's *Permanent Fortification* and his *Field Fortification*; Clarke's *Fortification* (1907); *Engineer's Field Manual*, U. S. Army (1907); *Notes on Field Fortification* (Army Service Schools, Fort Leavenworth, Kans.); *Reports of the U. S. War Department*.

Fort Jay, U. S. military post on Governor's Island, New York Harbor, formerly known as Fort Columbus. The present fortifications were built in 1806, upon the site of an earlier earthwork.

Fort Leavenworth, a U. S. military post in Leavenworth Co., Kansas, 10 m. n.w. of Kansas City. It was established in 1827 to protect the Santa Fé trail. A large garrison is stationed here, and it is the seat of the Army Service Schools and an important military prison.

Fort Lee, borough, New Jersey, Bergen co., on the Hudson River, at the lower end of the Palisades, and opposite the upper part of Manhattan Island. It is the western terminus of the Washington Bridge. During the American Revolution a fort occupied the site of the town and here General Greene narrowly escaped capture by Cornwallis. A memorial shaft was erected by the State and the Sons of the American Revolution in 1908; p. 9,468.

Fort McHenry, a former U. S. military post, one of the defences of Baltimore, Md., on Whetstone Point; established in 1794. A British fleet under Admiral Cockburn bombarded it in September, 1814, but was unable to reduce it. This bombardment inspired

Francis Scott Key to write 'The Star-Spangled Banner.'

Fort Madison, city, Iowa, county seat of Lee co., on the Mississippi River. The city is the seat of a State penitentiary. It has many machine shops and factories and mills. The first settlement was made in 1808, at the time of the erection of the old fort, which was burned in 1813; p. 14,063.

Fort Monroe, or **Fortress Monroe**, fort and U. S. military post, Virginia, located at Old Point Comfort. Together with Fort Wool, it commands the entrance to Hampton Roads and is the headquarters of the coast defences of Chesapeake Bay. Jefferson Davis was imprisoned here for two years, after the Civil War.

Fort Montgomery, built in 1777 near West Point to protect the Hudson River from the British fleet.

Fort Myers, city, Florida. It is a popular resort for fishermen and sportsmen, and has canning and fishing industries; p. 10,604.

Fort Plain, village, New York, Montgomery co. It manufactures silk, paper, flour; p. 2,906. The village was settled in 1832.

Fortress, the term sometimes used to denote a large permanent fortification or a number of forts. In the United States the only use of the term is in *Fortress Monroe*, an alternative name for Fort Monroe.

Forts. The term fort, in its strictest sense, is defined as 'a single enclosed work capable of independent defence; any fortification having a scarp and ditch, parapet or stockade, held by a garrison.' In the *United States*, however, the word is used to denote all permanent military posts or stations. See FORTIFICATION; COAST ARTILLERY; ARMY OF THE U. S.

Fort Schuyler, U. S. military post, one of the defences of the northern entrance to New York Harbor. It is a sub-post of Fort Totten. The post was established in 1856; although fortification began in 1833. It occupies for its reservation 52 acres on Throgg's Neck, L. I.

Fort Scott, city, Kansas, county seat of Bourbon co. The city is the seat of the State Normal Academy. It has many industrial establishments. The surrounding country is a region of unusual fertility and the city is a shipping point; p. 10,557.

Fort Smith, city, Arkansas, county seat of Sebastian co. The old fort and the national cemetery are features of interest. Industries include lumber mills, iron and steel rolling mills. The city is the centre of a region rich in coal and agricultural products, and has a large trade; p. 36,584.

Fort Sumter. See **Sumter**.

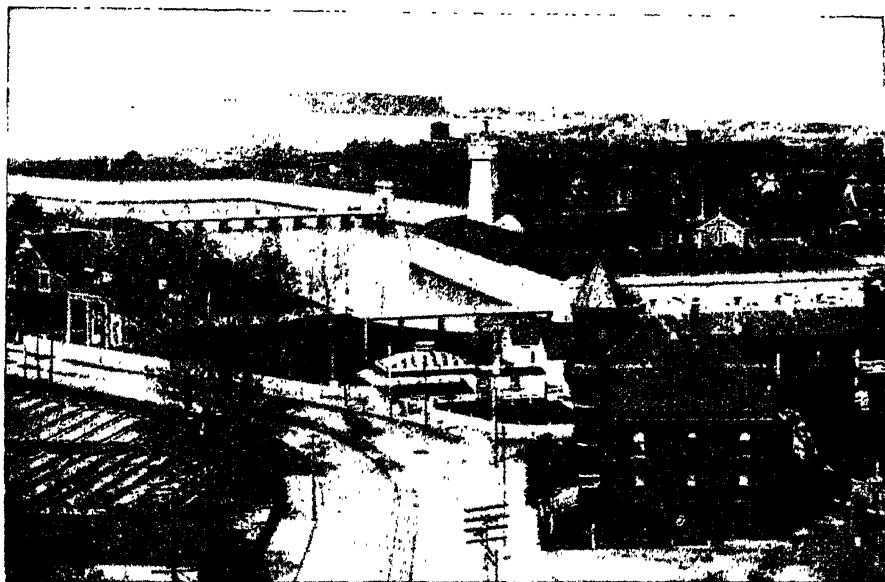
Fort Ticonderoga. See **Ticonderoga, Fort**.

Fort Totten, a U. S. military post on Long Island, New York, at the western end of Long Island Sound; 2 m. e. of Whitestone. Once one of the chief defences of the northern entrance to New York Harbor, it has been used solely as an Army post in recent years.

Fortuna, called by the Greeks *Tyche*, was in classical mythology the goddess of chance. She differed from Destiny or Fate in so far as she worked without law, giving or taking away at her own pleasure, and dispensing joy or sorrow indifferently.

Afro-American journalist. He studied at Howard Univ., later taught in the public schools of Florida. In 1880 he established the weekly *New York Globe*, which was subsequently published as *The Freeman* and *The Ages*, journals devoted to the interests of the Afro-American race. Through editorials written for the *New York Evening Sun*, he constantly endeavored to bring about better education for his race. His published works include: *Black and White* (1884), *The Negro in Politics* (1888), and *Dreams of Life* (poems).

Fortune Telling, the act of predicting future events, as by the inspection of tea leaves in a cup, the reading of playing cards, palmis



Fort Monroe, Showing Moat and Sally Port.

Fortunate Isles. See **Isles of the Blest**.

Fortunatus, the hero of an old and popular romance. The substance of the story is that Fortunatus and his sons after him are the possessors of an inexhaustible purse of gold and a wishing cap, which, however, in the end, prove the cause of their ruin.

Fortunatus, Venantius Honorius Clementianus (c.530-c.600), ecclesiastic and poet, was born near Treviso, Italy. He studied at Ravenna, and travelled, eventually taking up his residence at Poitiers, where he became the friend of Queen Radegunda and Gregory of Tours. He was the leading Latin poet of his day.

Fortune, Timothy Thomas (1856-1928),

try, astrology, and crystal gazing. In England, any person who pretends or proposes to tell fortunes is punishable under the Vagrancy Act as a rogue and a vagabond; while in the United States professional fortune tellers are generally classed as disorderly persons, and may be punished for misdemeanor.

Fortuny y Carbo, Mariano José Maria (1838-74), an eminent Spanish painter and etcher, was born in Réus, Catalonia. While serving on the staff of General Prim during the war in Morocco (1859-60) he began to sketch Oriental scenes, and to form the style which became characteristic of his later work. Between 1860 and 1865, Fortuny, having acquired a mastery of technique, worked as a designer.

In Rome, he established a studio which became the centre of a brilliant literary and artistic circle. Among his best known works are *The Arabian Fantasia*, *The Hindu Snake Charmer*, *The Tribunal of a Cadi*, *The Praying Arab*, *The Spanish Marriage* (1868), *The Espada* (1869), *The Selection of a Model* (1870), and *The Garden of a Poet*. Many of his paintings are in public and private collections in the United States, including *Lady in Black*, *A Court Fool*, and *Arab Fantasia at Tangiers*, in the Metropolitan Museum of Art, New York City. Consult *Life* in French by C. Davillier and by Yriarte; Downes' *Twelve Great Artists*.

Fort Wadsworth, a United States military post situated on Staten Island, N. Y. It was established in 1827 and named for General Wadsworth, who lost his life in the Battle of the Wilderness.

Fort Washington, a military post of the American Revolution, situated on the n.w. heights of Manhattan Island. This is between the present 181st and 186th Streets, the eastern terminus of the Washington Bridge across the Hudson. The fort was built in 1776 by Gen. Charles Lee in an endeavor to block the Hudson against the British. Full plans and descriptions of the fort were given by a deserter to Sir William Howe, who, on Nov. 16, 1776, attacked it with a force of 15,000 men. Driven from the heights and penned in the fort, the entire garrison surrendered.

Fort Wayne, city, Indiana, county seat of Allen co. Fort Wayne is situated in an agricultural region, for which it is the chief distributing centre, and has many important industries. The site of Fort Wayne was formerly the chief village of the Miami Indians. In 1790 American troops, under General Harmar, burned the village, and in 1794 Gen. Anthony Wayne erected a fort here, which withstood a determined Indian attack in 1812. Fort Wayne was chartered as a city in 1839, and grew rapidly during the period of railroad development, between 1850 and 1860; p. 118,410.

Fort William. See *Calcutta*.

Fort William, city, Thunder Bay district, Ontario, Canada, situated at the head of navigation on Lake Superior. The city has excellent harbor and shipping facilities, and is an important outlet for the wheat trade of Western Canada; p. (1911) 16,499; (1921) 20,086.

Fort Worth, city, Texas, county seat of Tarrant co., is situated in a rich stock-raising, grain, and cotton district. It was founded as a military post in 1849. Since 1900 the growth of the city has been extremely rapid; p. 177,748.

Forty-Niners, the name given to those im-

migrants who, in 1849, were drawn to California by the gold discoveries of 1848. Within the year about 42,000 immigrants arrived by land and 30,000 by sea, the great mass being from the United States, although Latin America furnished a large number. Those from the Atlantic slope came mainly by sea, either rounding Cape Horn, or going to Chagres, whence they crossed the Isthmus to Panama; those nearer West came chiefly by prairie schooner, crossing the plains, the Great Desert, and the Rocky Mountains. Either journey was fraught with hardships and danger of death. Throngs attempted the journey in any craft available, and many were lost by the way. The immigrants were of every nationality, class, and color. All struggled, fought, and fused into a new type, aptly portrayed by Bret Harte in *The Argonauts* of '49. Consult also Bayard Taylor's *El Dorado*; Audubon's *Western Journal*, 1849-50; White's *The Fortyniners* (1918).

Forty Thieves. See *Ali Baba*.

Forum, the name given by the Romans to the large public square of a city. While some *fora* were used only for markets, those for courts and public meetings (*fora judicialia*) were never without business annexes, money lenders, especially, having their shops in the abutting buildings or porticoes. Rome during most of the Republic had but one such square, and as 'The Forum' it is still famous for its dramatic part in the history of the city. It occupied a filled-in swamp comprising about 4 1/2 acres and extending from the foot of the Capitoline Hill to the northeastern part of the Palatine. The central space was long the meeting place of the plebs, *Comitia Tributa*; while the patricians, *Comitia Centuriata*, met on the Comitium adjoining.

In the centre was a mound or stage called the *rostrum*, because of the ships' beaks placed on its sides in commemoration of some historic conquest; from the rostrum orators made their addresses. Gladiatorial games were held in the Forum, and important public executions took place there. See *ROME*.

Forum, The, an American review founded in New York in 1886, for the discussion of social, political, and literary subjects.

Forward, **Walter** (1786-1852), American lawyer and public official, was born in Hartford co., Conn. He removed to Pittsburgh, Pa., in 1803, where he became editor of *The Tree of Liberty*, a Democratic journal. In 1841 President Harrison made him the first controller of the currency; and the same year he became Secretary of the Treasury in the Cabinet of President Tyler, resigning in 1843.

Foscari, Francesco (c. 1370-1457), Venetian doge, was born in Venice. Elected doge in 1423, he speedily concluded an alliance with Florence, Naples, and Savoy, and secured the celebrated Milanese general Carmagnola to lead the allied armies against his former master. Foscari's latter years were rendered wretched by the intrigues of his enemies against his youngest son GRACOPO. At length the Loredani, his hereditary foes, triumphed, and procured the old man's expulsion from the dogate (1457).

Foscolo, Ugo (1778-1827), Italian poet and patriot, one of the greatest of Italian writers and thinkers, was born in Zante, one of the Ionian Islands. His first production was a drama, *Tieste* (1797), which won popular favor. At first an admirer of Napoleon, he afterwards revealed his disapproval in *Lettere di Jacopo Ortis* (1798). In 1807, he published his best poem, *I Sepolcri*. In 1809 Foscolo was appointed professor of Italian eloquence at Pavia, where he did splendid work in fostering a love of freedom among his young countrymen, until his chair was suppressed. When the Austrians entered Italy (1813) he was forced to flee, seeking shelter in England (1816). There he wrote *Essays of Petrarch* (1821), *Discorso Storico sul Testo del Decamerone* (1825), and *Discorso sulla Testo della Commedia di Dante* (1825).

Fosdick, Harry Emerson (1878-), American clergyman, was born in Buffalo, N. Y. He was educated at Colgate University-Hamilton, N. Y., at Union Theological Seminary and Columbia University, New York City. He was ordained as a Baptist minister in 1903 and from 1904 to 1915 was pastor of the First Church of Montclair, N. J. He was instructor in homiletics (1908-15) and professor of practical theology at Union Theological Seminary (1915). For six years he served as special preacher at the First Presbyterian Church, New York City, and in 1925 was called as pastor to the Park Avenue Baptist Church. Later he became pastor of the Riverside Church, New York. His published works include *The Second Mile* (1909); *The Manhood of the Master* (1913); *The Assurance of Immortality* (1913); *The Meaning of Prayer* (1915); *The Challenge of the Present Crisis* (1917); *The Meaning of Faith* (1917); *The Meaning of Service* (1920); *Christianity and Progress* (1922); *Twelve Tests of Character* (1923); *The Modern Use of the Bible* (1924); *Spiritual Values and Eternal Life* (1927); *A Pilgrimage to Palestine*, (1927); *As I See Religion* (1932); *The Hope of the World* (1933).

His latest book, *On Being a Real Person*, appeared in 1943.

Fosdick, James William (1858-1937), American mural painter, executed mural decorations for the Pennsylvania Academy of Fine Arts, the St. Louis Museum, and for many private homes. Among his more important works are: *Glorification of St. Jeanne d'Arc* (Evans Collection, National Gallery of Fine Arts); Pentaptych of the life of Jeanne d'Arc in the Church of St. Joan of Arc, Jackson Heights, L. I.

Fosdick, Raymond Blaine (1883-), American lawyer and economist, was born in Buffalo, N. Y. In 1913 he was commissioned by the Rockefeller Bureau of Social Hygiene to visit Europe and study the police organizations there. In 1915-16 he was a member of the New York City Board of Education: special representative of the U. S. War Department in France (1918-19), and undersecretary general of the League of Nations (1919-20). His publications include *European Police Systems* (1915); *Keeping Our Fighters Fit* (1918); *American Police Systems* (1920); *The Old Savage in the New Civilization* (1928).

Foss, or Fosse in fortification, is a ditch or moat, either with or without water, immediately without the wall.

Foss, Cyrus David (1834-1910), American clergyman, was born in Kingston, N. Y. In 1857 he entered the itinerant ministry of the Methodist Episcopal Church, and was pastor of churches in Chester, N. Y., Brooklyn, and New York City (1865-75). From 1875 to 1880 he was president of Wesleyan University, when he became a bishop. He published: *From the Himalayas to the Equator* (1899); *Religious certainties* (1905); *Temperance and the Pulpit* (1910).

Foss, Sam Walter (1858-1911), American humorous writer, edited successively *The Saturday Union* (1883-7) and *The Yankee Blade* (1887-95), and was also on the editorial staff of the *Boston Globe* (1889-95). He gave readings from his own poems. Among them are: *Back Country Poems* (1894); *Songs of the Average Man* (1907).

Fossa, or Foussa (*Cryptoprocta ferox*), a small savage carnivore peculiar to Madagascar, the largest flesh-eating animal of that island.

Fossano, town and episcopal see, Italy. Features of interest are the 14th-century castle, a cathedral, several palaces.

Fossil Forests, a term given to groups of petrified tree trunks, which occur in a number of States in the United States, in England, Nova Scotia, Silesia, Egypt, and the island of

Antigua in the West Indies. Some of the finest specimens of fossilized forests are to be found in the Yellowstone National Park region. As the softer rock has gradually worn away, the petrified trunks of the more recent forests, stripped of branches and leaves by falling volcanic matter, have been left standing erect on the hillsides. The tallest of the trees now upright is only about 30 feet high, but it has obviously been broken off. The fossil forests of Arizona differ from those of the Yellowstone in that they consist of fallen trunks which, after falling, drifted down a water course and lodged in some eddy or a sand bank. Later they were buried by sand and clay, finally to a depth of several thousand feet, where the conversion to stone was effected by gradual replacement of the woody material by silica in the form of chalcedony, deposited by underground water. A small amount of iron oxides deposited at the same time has given the brilliant and beautiful brown, yellow, and red tints which appear in much of the material. There are four of these forests, included in a Government reservation called 'Petrified Forest National Monument.'

Fossils, a term formerly applied to whatever was dug out of the earth, whether mineral or organic. The term is now restricted to remains and relics of plants and animals which have become embedded by natural causes. These fossils may consist of the harder and more durable parts of animals and plants, or they may be merely the casts or impressions of such remains, or the footmarks or tracks which animals may have left behind them on some soft surface which has been subsequently covered up and consolidated. They occur in nearly all the stratified aqueous rocks, which have on this account been called Fossiliferous Strata. Whole mammoths have been enclosed in the frozen soils of Siberia. The oldest rocks, with very few exceptions, contain fewest fossils, not necessarily because life flourished with less vigor and less manifold variety in the earlier epochs, but because the ravages of time have obliterated the fossil remains. Fossils are preserved in many different ways. Some may be mere casts or impressions, like the traces of leaves on the beds of sandstone, or the hollow cavities left when the bones of some extinct animal have been entirely dissolved away. In contradistinction to such cases as these are the instances of complete preservation like the flies in amber, every minute structure of which has been retained.

Fossils are of the greatest importance to the geologist, not only for the light they throw on

the history and development of the animal kingdom, but also for the indications they give as to the age of the beds in which they occur, and the conditions under which they were deposited. Each fossiliferous rock bed contains characteristic forms or groups of forms that determine the period in which it was mud or sand. The study of fossils is known as *Palaeontology*. In the United States, the economic importance of palaeontology has been shown repeatedly. In the earlier exploitation of anthracite coal, thousands of dollars were fruitlessly expended in New York in search of coal beds until the geologists showed that the beds in that State could contain no coal. The fossils in the New York rocks exploited are of Devonian age, whereas the fossils of the Pennsylvanian anthracite coal beds belong to the Carboniferous, a much later period.

Foster, Benjamin (1852-1926), American painter, born North Anson, Me. He studied art under Abbott Thayer in New York; and in Paris. Returning to New York in 1887, he devoted himself to landscape and animal painting. Some of his paintings are: *Lulled by the Murmur of a Brook* (Luxembourg); *In the Connecticut Hills* (Metropolitan Museum of Art); *Birch Clad Hills* (National Gallery).

Foster, Charles (1828-1904), American public official. From 1870 to 1878 he was a Member of Congress, and as a member of the Ways and Means Committee was instrumental in bringing the Sandborn contract frauds to light. From 1879 to 1884 he was governor of Ohio; in 1889 he was chairman of the commission appointed by President Harrison to draw up a treaty with the Sioux Indians; and from February, 1891, to March, 1893, he served as Secretary of the Treasury in Harrison's Cabinet.

Foster, Henry (1796-1831), English navigator and scientist, made a number of voyages to North and South America, and in 1829-31 voyaged to the South Seas, rounded the Cape, and eventually landed at Panama. He was drowned in the Chagres River. His *Narrative* of this voyage was edited by Webster (1834).

Foster, John Gray (1823-74), American military engineer. At the outbreak of the Civil War he was one of the defenders of Fort Sumter. After the war he was engaged on important engineering work, including the improvement of Boston Harbor and the construction of fortifications at Portsmouth.

Foster, John Watson (1836-1917), American diplomat and public official, born in Pike co., Ind. In 1865-9 he was editor of the *Evansville Daily Journal*. He then entered the dip-

lomatic service, and was Minister to Mexico (1873-80), to Russia (1880-81), and to Spain (1883-5). In 1892-3 he was Secretary of State in President Harrison's Cabinet. He was agent of the United States in the Bering Sea Arbitration at Paris (1893); member of the Anglo-Canadian Commission (1896); U. S. agent in the Alaskan Boundary Tribunal at London (1903); and was plenipotentiary and ambassador on several special missions to foreign countries. On the invitation of the emperor of China he took part in the peace negotiations with Japan, and he represented China at the Second Hague Conference (1907). He published: *A Century of American Diplomacy* (1900); *American Diplomacy in the Orient* (1903); *Arbitration and The Hague Court* (1904); *The Practice of Diplomacy* (1906); *Diplomatic Memoirs* (2 vols., 1909).

Foster, Lafayette Sabine (1806-80), American political leader. From 1855 to 1866 he was a member of the U. S. Senate; was chairman of the Committee on Foreign Affairs during the Civil War; and in 1866 was president *pro tem* of the Senate and acting Vice-President of the United States. In 1870-76 he served as a judge of the Connecticut Supreme Court. By his will he endowed a professorship of English law at Yale, bequeathed his library to the town of Norwich, and gave his home for a free academy.

Foster, Myles Birket (1825-99), English water-color painter and engraver, was born in North Shields. After a successful career as an engraver he turned to water-color drawing in 1859. Among his best achievements as an engraver were illustrations for Longfellow's *Evangeline* (1850) and for other works of that poet (1852).

Foster, Robert Frederick (1853-), authority on card games, was born in Edinburgh, Scotland. He became card editor of the *New York Sun* in 1895, and has been a contributor to the *New York Tribune* since 1919. He originated the eleven rules of bridge whist. He has published many books on games, such as *Foster's Complete Bridge*.

Foster, Stephen Collins (1826-64), American musical composer and song-writer, was born at Lawrenceville, near Pittsburg, Pa., and received instruction in vocal and instrumental music at an early age. His 'Old Folks at Home' was published in 1850. About one-quarter of his 125 songs, of which he wrote both words and music, were of the pathetic negro melody, which Foster did most to develop. After 1860 he lived in New York city. Among his songs 'Nellie Bly,' 'The Old Folks

at Home,' 'Old Black Joe,' 'Nelly was a Lady,' 'Massa's in the Cold, Cold Ground,' and 'Come where my Love lies Dreaming,' may be specially mentioned.

Fotheringhay, parish and village, Northamptonshire, England. Its castle, founded early in the 12th century, was the birthplace of Richard III., and the scene of the imprisonment, trial and execution of Mary, Queen of Scots in 1587. Only a few fragments of the castle remain.

Foucault, Jean Bernard Léon (1819-68), French physicist. In 1851 his proof of the rotation of the earth by means of the pendulum won for Foucault a wide reputation, increased later by his invention of the gyroscope. He was largely responsible for the introduction of physics into the study of astronomy. See *Notice Historique sur la Vie et les Travaux de Léon Foucault*, by Lissaiou (1875); also *Recueil des Travaux Scientifiques de Léon Foucault*, ed. by Gariel and Bertrand (1878).

Foucault Currents are electrical currents induced in a mass of metal when in a magnetic field of varying intensity.

Fouché, Joseph, Duke of Otranto (1759-1820), minister of police under Napoleon, was born in the diocese of Nantes. As a member of the National Convention in 1792, he strongly advocated the execution of the king. In 1794 he put down with great severity (assisted by Collot d'Herbois) the revolt in Lyons, and for this was elected president of the Jacobin Club in Paris. Fouché was appointed minister (or chief) of police (1799), and continued in office under Napoleon, holding in addition the portfolio of minister of the interior. He held the former post for a time under Louis XVIII., but resigned it in 1815, and died in exile at Trieste. Among Fouché's writings are *Notes aux Ministres Etrangers* (1815), and *Lettre au duc de Wellington* (1817). See Martel's *Etude sur Fouché* (1873-9) and Madelin's *Fouché* (new ed. 1903).

Fouquet, Jean (1415-6. 1485), French painter, born at Tours: studied in Italy, and settling in Paris (1460), became court painter to Louis XI. He was most successful as a miniature painter: his best work of this kind was embodied in a breviary for Etienne Chevalier (at Chantilly). Among his other works are illustrations in *Boccaccio* and a *Book of Hours*.

Fougade, or **Fougasse** (Fr.), a term in fortification meaning a small mine dug deep in the ground and filled with gunpowder, stones, bombs, etc. The fougasse is fired from the surface by fuse or electricity.

Fougères, town, department Ille-et-Vi-

laine, France. Its castle dates from the 11th century. There are several ancient churches.

Fould, Achille (1800-67), French politician and financier, after the revolution of 1848 was appointed minister of finance, holding the post with one short interval until 1852. Created a senator, on the proclamation of the empire he was appointed minister of state and director of the imperial household. In 1861 he was again finance minister. He originated the *Crédit Mobilier*, and reestablished his country's credit.

Foulis, Andrew (1712-75), Scottish printer and art patron. He joined the printing establishment of his elder brother, Robert Foulis (1707-76). For thirty years the brothers produced beautiful editions of the classics.

Foulke, William Dudley (1848-1935), American lawyer, political economist, born New York. He graduated at Columbia in 1869 and at the Columbia Law School in 1871. In 1876 he moved to Indiana, was a state senator in 1882-6, and was U. S. Civil Service Commissioner in 1901-3. He published *Slav or Saxon* (1887, 1899, 1904); *Life of Oliver P. Morton* (1899); *Maya, a Story of Yucatan* (1900); *Protean Papers* (1903).

Foundation for the Promotion of Industrial Peace, an organization incorporated by the U. S. Congress in 1907, in accordance with a plan formulated by President Roosevelt. In 1906 the President was awarded one of the Nobel prizes (\$40,000) for his efforts to promote the peace of the world, and offered the amount of the prize as a nucleus for a fund to promote peace among the industrial activities of the country.

Foundations. In ordinary language, the foundation of a structure is what it stands upon, but the word is applied technically in two or three different senses. The matter is one of great importance in engineering and requires the most careful work.

Natural Foundations.—When the structure may be based upon the solid rock, the best of all foundations is reached; but in any case the material upon which the foundation rests must have a unit resistance to lateral displacement, disruption, or compression, greater than the load per unit area applied to it by the structure above. *Concrete Foundations* have long been employed for houses, public buildings, and quay walls, resting upon alluvial beds at a moderate depth. *Pile Foundations* are employed where the surface material is weak and easily penetrable. Timber 'bearing-piles' of the required length are driven down through the soft material. *Cofferdams* have furnished a means for the building of bridge piers in deep water.

They form an enclosure, within which the site may be laid dry; and they are generally constructed by driving two or three rows of close sheet-piling containing a water-tight wall of puddle between the walls of timber. *Caissons* are hollow box-like structures constructed of steel or of timber. The building of the masonry structure is commenced upon the roof of the working chamber before it sinks and the building is carried up as the sinking proceeds, while the excavators are carrying on their work beneath the base of the structure. The East River bridges, connecting the boroughs of New York and Brooklyn, the Forth Bridge, the deep-water quay at Antwerp, and a graving dock at Toulon are among the structures that have been founded by this process. The open-topped caisson has been preferred for some very deep foundations, as, for example, in the Poughkeepsie, Benares, and Hawkesbury bridges.

The 'pneumatic process' received another application in the driving of subaqueous tunnels. Here again the operations are greatly helped when the inflow of water and of mobile earthy material is arrested by an internal pneumatic pressure balancing the external hydrostatic pressure. Useful works on this subject are, Fowler's *Ordinary Foundations, Including the Cofferdam Process for Piers* (1898); Patton's *A Practical Treatise on Foundations* (1893); and Baker's *A Treatise on Masonry Construction* (1900).

Foundling Hospitals have for their general object the prevention of infanticide and of the exposure and abandonment of children. The modern efforts are to keep mothers and children together, so that the hospitals are mostly obsolete. The earliest instance of provision being made for abandoned children is the method adopted by the bishop of Treves in the 6th century, who ordained that any child placed in a marble basin which stood outside the cathedral should be cared for by the church. After the decree of the Council of Nicaea (A.D. 787), that a foundling hospital should be established in each city, the institutions multiplied considerably, that of Milan (787), the earliest of which we have certain knowledge, being followed by those at Montpellier (1070), Rome (1212), Paris (1362), Venice (1380), and others.

In Russia the great foundling hospitals at Moscow and St. Petersburg were founded by Catherine II. The U. S. S. R. has replaced such institutions by village nurseries and homes for mothers, married or unmarried. The Foundling Hospital in London was founded by Captain Thomas Coram for the reception of ille-

gitimate children, and was incorporated by royal charter in 1739. At one time, all children placed in a basket which hung outside the hospital were received. Later, however, the authorities instituted inquiries as to the genuineness of the case, the desertion of the father, and the previous good character of the mother. As is the modern practice in most countries, now, the children are placed out to nurse with cottagers in the country. In 1926 the old estate belonging to the London Hospital was sold, and new premises in the country decided upon. In Rome, the great asylum of Santo Spirito admitted children originally by means of the *rota*, or revolving box, allowing of the reception of the child without the person depositing it being seen by the official—a method discarded in other countries owing to its effect on the increase of cases. The New York Foundling Asylum was established in 1869, and received 1,399 babes the first year. It was organized by the Sisters of Charity. The mothers are received if they act as nurses. This is still the largest hospital of its sort in the United States. On the whole, care for abandoned children is restricted to social service groups and organized societies that are able to find them homes in private families or establish the mothers in positions to care for them. Dr. George E. Shipman of Chicago and Dr. John S. Parry in Philadelphia were leaders in the movement to care for American foundlings. See Hügél's *Die Findelhäuser und das Findelwesen Europas* (1863); Emminghaus's *Das Armenwesen und die Armengesetzgebung in Europäischen Staaten* (1870; partial Eng. trans. by Mr. Eastwick, 1873); Warner's *American Charities* (1894); Folks's *Care of Destitute, Neglected, and Delinquent Children* (1902); Henderson's *Introduction to Study of Dependent, Defective, and Delinquent Classes* (1902); A. Lallemand's *Histoire des Enfants Abandonnés et Délaissés* (1885); and articles in *Revue des Deux Mondes* (1846, 1864, and 1870).

Fountain, a spring of water furnished with an artificial basin or other structure at the point of emergence. In ancient times fountains were frequently erected in honor of the deity to whom the spring was sacred. Ancient Greece possessed numerous sacred fountains, among others those at Megara, built by Theagenes, those at Pirene and Glauce at Corinth, the fountain Enneacrunus, and that in the temple of Erechtheus (supplied by salt water) at Athens. In Rome fountains were the only source of water supply for the poorer citizens. Examples of mediaeval fountains are still to be found in various parts of Europe, though, ex-

cept in Italy, few are of earlier date than 1300. In modern times fountains have become largely ornamental, the chief exception being the drinking-fountain of the streets erected either by philanthropic or municipal enterprise. Of ornamental fountains the most conspicuous examples are those at Versailles.

Fountains Abbey, ruined abbey, Yorkshire, England. It was founded in 1132 for the Cistercians by Archbishop Thurstan of York.

Fouqué, Friedrich Karl Heinrich de la Motte (1777-1843), German novelist. He wrote novels, legends, and plays (the best known being *Sigurd der Schlängentöter*, 1808, a weak handling of the grand Norse theme), and enjoyed great popularity. Very few of his tales are now read, except *Undine* (1811).

Fouquet, or Foucquet, Nicolas (1615-80), Vicomte de Melun et Vaux, and Marquis de Belle-Ile, minister of finance under Louis XIV. A quarrel with Mazarin and the ill-will of Colbert were, however, followed by the displeasure of the king, who connected the growing deficits in the treasury with the personal extravagance of Fouquet. Arrested in 1661, he was condemned to imprisonment for life in the fortress of Pignerol. See Chérueil's *Mémoires* (1862); Lair's *Nicolas Fouquet* (1890).

Fouquier, Jacques François Henri (1838-1901), French publicist, in 1867 accompanied Garibaldi as the representative of *L'Indépendance Belge*. Returning from Marseilles to Paris in 1873, he contributed to various journals, and was one of the founders of *Le Petit Parisien*. In 1878 he became dramatic critic to the *Dix-neuvième Siècle*, and in 1891 was appointed to the same post on *Le Figaro*.

Fouquier-Tinville, Antoine Quentin (1747-95), public prosecutor during the Reign of Terror, born at Hérouël (Aisne), entered the secret service of the Paris police. At the revolution, through the influence of Danton and Robespierre, he became public prosecutor (1793), and discharged his duties with pitiless rigor. Danton and Robespierre were among those whose condemnation he obtained. Imprisoned at last by the National Convention, he himself was condemned to death, after a trial of forty-one days. See *Mémoire pour A. Q. Fouquier* (1794); Domenget's *Fouquier-Tinville et le Tribunal révolutionnaire* (1878).

Four-eyed Fish, a small fresh-water cyprinodont fish of the genus *Anableps*, of which several species inhabit streams in the warmer parts of America. They swim at the surface of the water, with the top of the head, on which the eyes are situated, slightly out of water.

Fourier, François Marie Charles (1772-

1837), French social philosopher. His schemes for the reorganization of society are set forth in his *Théorie des Quatre Mouvements et des Destinées Générales* (anon. 1808), *Traité d'Association Domestique Agricole* (1822; summary in 1823), and *Le Nouveau Monde Industriel et Sociétaire* (1829). It is for his communistic scheme that his name is chiefly remembered. The scheme, in brief, is as follows: Let society be divided into sections (*phalanges*); each *phalange*, lodged in a *phalanstère* or common building, surrounded by a square league of arable land, is to be self-governing, though federation between the *phalanges* is optional. The monotony of labor is obviated by alternation of duties; and after payment of a minimum wage to each member, the surplus wealth is divided in shares—five-twelfths being apportioned to labor, four to capital, and three to talent. The privacy of home life may be obtained, but marriage is virtually abolished. Fourier had followers in the U. S., who established at *Brook Farm*, in Mass., a community based on the principles of co-operation. See Pallarin's *Fourier, sa Vie et Théorie*; Gatti de Gamond's *Fourier et son Système* (1841); and Ely's *French and German Socialism in Modern Times* (1883). See also J. S. Mill's *Political Economy*.

Fourier, Jean Baptiste Joseph, Baron de (1768-1830), French mathematician, accompanied (1798) Napoleon to Egypt, where he took an important part in the government of the country, and acted as secretary to the Egyptian Institute. He wrote the historical introduction to the *Description de l'Égypte, La Théorie Analytique de la Chaleur* (1822), and other books.

Fourier Series, infinite series of a special type, named after Fourier, who first showed their importance in his great work on the theory of heat. The series is of the form—

$$\begin{aligned} &a_0 + a_1 \cos \theta + a_2 \cos 2\theta + \dots \\ &\quad + a_n \cos n\theta + \dots \\ &+ b_1 \sin \theta + b_2 \sin 2\theta + \dots \\ &\quad + b_n \sin n\theta + \dots \end{aligned}$$

where the coefficients a_1, b_1 are independent of the argument θ .

Fourth Estate, a term applied by Edmund Burke to the public press, in allusion to the three estates of the realm—viz. lords, clergy, and commons—which constitute the British Parliament.

Fowler, Charles Henry (1837-1908), American M. E. bishop, born in Buford, Canada. He graduated at Syracuse University, and in 1859 began the practice of law in Chicago; but after his conversion he graduated at the Gar-

rett Biblical Institute in 1861. He was for 11 years pastor of various churches in Chicago, and in 1872 was elected president of the Northwestern University at Evanston, Ill., which position he resigned upon being appointed editor of the New York *Christian Advocate* in 1876. In 1884 he was elected a bishop. He subsequently visited Japan, Korea, China, Russia, and other countries, organizing the Peking and Nanking universities, and the first M. E. church in St. Petersburg.

Fowler, Frank (1852-1910), American painter, born in Brooklyn, N. Y., and studied art with Edward White at Florence, and with Carolus-Duran, and at the Ecole des Beaux Arts in Paris. While in Paris Mr. Fowler assisted Carolus-Duran in painting a ceiling for the palace of the Luxembourg, which was ultimately placed in the Louvre, where it is now to be seen. Returning to New York in 1879, he established his studio in that city and devoted himself to portrait and figure work. His portraits of distinguished people include those of Samuel J. Tilden, Madame Modjeska, President Hadley of Yale, and many officers and professors for the U. S. Military Academy, West Point, N. Y.

Fowler, Henry Hartley, Viscount (1830-1911), English statesman, entered Parliament in 1880 for Wolverhampton, where he practised as a solicitor, and which he represented for many years. He was under-secretary for the home department in Mr. Gladstone's government (1884-5), and then financial secretary to the Treasury during the last months of the administration (1885-6). When Mr. Gladstone retired from public life, Mr. Fowler was transferred to the India Office as Secretary of State. In 1905 he became Chancellor of the Duchy in the Campbell-Bannerman ministry, an office he retained under Mr. Asquith.

Fowler, Sir John (1817-98), English civil engineer, was born at Sheffield. The London Metropolitan Underground Railway was his work, including branch lines to the suburbs, etc. The work for which Fowler is best remembered is the construction, in partnership with Sir Benjamin Baker, of the Forth Bridge (1883-90), for which Fowler received a baronetcy. See *Life* by T. Mackay (1900).

Fox, a group of animals belonging to the dog family (Canidae), characterized by their slight build, long bushy tails, short legs, and usually long ears. The pupil of the eye is elliptical when contracted, and not circular, as in wolves, jackals, and domestic dogs. In habit the foxes are nocturnal and usually solitary. The intelligence and cunning of the foxes have

become proverbial, and their senses are remarkably acute. The common fox is *Canis vulpes*, which is widely distributed over Europe, Asia and America, and occurs in a number of color varieties. Among these are several esteemed of great value in the fur trade, as jet black; 'silver,' in which the hairs are black with



Red Fox.

white tips, giving a frosted appearance; and 'cross,' in which a reddish pelt is marked with blackish stripes along the spine and across the shoulders. The food consists largely of mice, rats, and even insects and worms, the familiar depredations on poultry yards and game being chiefly committed in spring, when food is required for the numerous cubs. The extraordinary cunning displayed by the hunted fox in Britain is probably to be ascribed to the fact that only the most intelligent forms in each generation will live long enough to breed. The scent by means of which foxes are hunted is due to a gland beneath the tail.

Other foxes are the gray fox (*C. virginianus*) of the Southern United States; the small, active kit or swift fox (*C. velox*) of the Plains; the Arctic fox (*C. lagopus*), which in its white or 'blue' winter dress is a valuable fur-animal; the desert fox (*C. leucopus*) of Asia, and the small East Indian fox (*C. bengalensis*). In the case of the Arctic fox, packs are cultivated on islands in the Aleutian archipelago, where they are fed, and a certain number are killed annually for their fur. See also FOX-HUNTING.

Fox, Indian tribe. See **FOXES**.

Fox, Austen G. (1849-1937), Amer. lawyer, born Newport, R. I., became vice-president of the Association of the Bar of the city of New York in 1893. He was special assistant district attorney in 1894-6 in the prosecution of police officials after the investigation by the Lexow Committee. In

1897 he was the candidate of the Citizen's Union for district attorney and in 1905 was chairman of the Committee of Nine on the police investigation.

Fox, Charles James (1739-1801), English statesman, born in London, entered Parliament in 1768. Largely under the influence of Burke, he became the virtual leader of the Whigs, and the active opponent of Lord North's American policy (1774-82), foretelling in the most eloquent language the eventual triumph of the American colonists. His part in the impeachment of Warren Hastings (1786), his Libel Act of 1791, his support of self-government for Canada (1791), his anxiety to improve the condition of the Irish peasantry, his efforts to obtain the abolition of the slave trade and the repeal of the Test Acts, and his advocacy of parliamentary reform, attest the sincerity of his Liberalism. During the French Revolution he never wavered in his attachment to popular freedom, although it cost him the friendship of Burke (1790), and reduced his party to some forty members. Burke calls him 'the most brilliant and accomplished debater that the world ever saw'. See Lord John Russell's *Life and Times of C. J. Fox* (1859-66); and Lecky's *Hist. of England* (vols. iii.-vi. 1882-7).

Fox, Fontaine Talbot (1884-), newspaper cartoonist, born in Louisville, Ky., where he began his career with the *Louisville Herald* and *Louisville Times*. He has since been cartoonist for syndicates, furnishing humorous cartoons to about 250 newspapers, the best-known being his 'Funny Folks' and 'The Toonerville Trolley.'

Fox, George (1624-91), founder of the Society of Friends or Quakers, born at Fenny-Drayton in Leicestershire, England. In 1648 he began those missionary journeys which practically filled the rest of his life, his object being to preach to all who would hear him the great truth of 'the Light within,' which had brought comfort to his own soul. A sect was gradually, though almost involuntarily, formed under the preaching of Fox and a band of earnest young men who gathered round him. To this sect the name of 'Quakers' was given in derision by a magistrate at Derby named Gervase Bennet, when Fox called upon him 'to tremble at the name of the Lord.' The refusal of the members of the new sect to doff their hats in token of respect for a superior, and their obstinate adherence to the grammatically correct 'thou' instead of the courtly 'you,' brought them into more trouble.

A great many years of Fox's life were passed

in prison. In 1670 he undertook a missionary journey to Jamaica and the American colonies. His principal writings are contained in the Philadelphia edition of his writings (1831). See Bickley's *Fox and the Early Quakers* (1884).

Fox, George L. (1825-77), American actor. After the Civil War he became manager of the old Bowery Theatre in New York, and later stage manager of the Olympic Theatre. His last performances were at Booth's Theatre in 1876.

Fox, Gustavus Vasa (1821-83), American naval officer. In 1861-6 Fox was assistant secretary of the navy, and in this capacity rendered services of a very high order. It was Fox who proposed and planned the New Orleans expedition and who chose Farragut for its commander. He was sent to Russia on a special mission in 1866, and took part in the negotiations leading to the purchase of Alaska by the U. S.

Fox, Henry Richard Vassall (1773-1840), English statesman. He was appointed in 1806 to negotiate a treaty with the U. S. through the American plenipotentiaries, Monroe and Pinckney. He was Lord Privy Seal in the ministry of 'All the Talents' from the death of Fox to the dismissal of the ministry. In 1796 he began the restoration of Holland House, and here he assembled a brilliant salon of statesmen and men of letters.

Fox, John, Jr. (1863-1919), American author, born in Bourbon co., Ky. He passed some time in newspaper work and business, finally settling at Big Stone Gap, Va., where the studies of mountain life contained in his novels were made. He published *A Mountain Europa* (1894), *A Cumberland Vendetta* (1895), *Hell for Sartain* (1896), *The Kentuckians* (1897), *Crittenden* (1900), and *The Little Shepherd of Kingdom Come* (1903). *Following the Sun Flag* (1905) is an account of his experiences as a correspondent in the Russo-Japanese War.

Fox, William (1879-), motion-picture producer, born in Hungary, brought to the United States and educated in the New York schools. He began as a theatrical manager in Brooklyn, N. Y., and became president of the Fox Theatres and the Fox Film Corporation, showing his films in many countries. Among his productions are *Les Misérables*, *Tale of Two Cities*, *Romeo and Juliet*, *A Daughter of the Gods*, *Salome*, *Cleopatra*, *Evangeline*, *Over the Hill and Queen of Sheba*. He did service in organizing the Red Cross drives during the World War. In 1930 he resigned as president of the

Fox Film Corporation, having sold his controlling interest.

Foxes, N. American Indians, a western branch of the Algonquin family, whose original home was about the headwaters of the Mississippi. But when the kindred Sacs were driven westward by the Iroquois in the 17th century, they were joined in the Green Bay district (Lake Michigan) by the Outtagaumies, as the Foxes called themselves. Later the two confederate and henceforth inseparable nations gained a footing in the Rock River valley, where they long held their ground. In 1900 they numbered 990 in Oklahoma, Iowa, and Kansas.

Foxglove is a name given to the members of the genus *Digitalis*. The name is a corruption of folks'-glove, which is the term used in the list of plants drawn up in the reign of Edward III. See *DIGITALIS*.

Foxhound. The foxhound of Great Britain is a dog of pedigree, most kennels having old stud-books, going back, in some instances, a hundred years. The modern foxhound is descended from the old southern hound (the nearest type of which now existing is the bloodhound), but its speed has been accelerated by crossing it with the pointer and by selection so that it has completely lost the loose skin throatiness, and wrinkles of the breed from which it claims descent. Foxhounds are hunted in packs, and are required to give tongue, a mute hound being at once drafted. They vary in size from 22 to 25 in. in height, each pack generally having its own standard. Although not a fast dog in appearance, a foxhound has been known to cover a mile under two minutes.

Fox-hunting. The chase of the fox did not come into general vogue until the middle of the 17th century. Lord Wilton, in his *Sports and Pursuits of the English* (1868), says that 'about the year 1750 hounds began to be entered solely for fox.' It was not until the 18th century, however, that fox-hunting as we know it, with its sumptuous expenses, its hard riding, and its refinements came into existence.

In common parlance fox-hunting in England is divided into two parts: the 'shires' and the 'provinces.' Leicestershire, Rutlandshire, and Northamptonshire comprise the former, the rest of England the latter. In the 'shires' are maintained packs of world-wide reputation, such as the Quorn, Pytchley, Belvoir, Cottesmore, and Atherstone. There are many hunt clubs in the U. S., the largest of which is the Meadow Brook, which hunts on Long Island in the spring and fall, although, owing to the absence of foxes, the 'drag' is generally used.

Other hunts of considerable prominence are the Myopia, Genesee Valley, Orange County, and Radnor, all of which have anywhere from 20 to 50 couples of hounds, English or American bred. In 1931 there were 219 packs in the British Isles, 83 in the U. S.

In England the sport was originally for the purpose of keeping down the foxes, which ravaged the barnyards, but it has long since become a pure sport, and the fox is rarely killed, in some hunts the animal being practically tame, and always allowed to escape to cover.

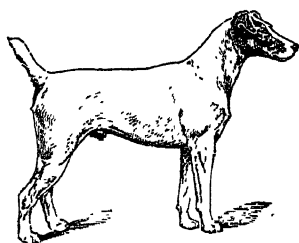
It was not until the 19th century that a fixed type of foxhound was settled. (See FOXHOUND.) In breeding hounds the litters should be timed to arrive in the months of March and April. Hound shows have greatly improved the breed. In the absence of foxes a drag is in some districts maintained. Usually a tame fox is kept in a kennel, and his litter, mixed with aniseed, is drawn over the ground in a bag by a hunt servant. The hounds will follow this trail at a surprising pace.

See T. F. Dale, *Fox-hunting in the Shires* (1903); Higginson and Chamberlain, *Hunts of the United States and Canada* (1908); H. A. Bryden, *Horn and Hound* (1927); Dixon, *Fox Hunting in the 20th Century* (1925); L. D. R. Edwards' *Huntsmen Past and Present* (1929).

Fox Islands, group of Aleutian Islands, Alaska, w. of Unimak Pass.

Fox River, Wisconsin, flows mainly n.e. (through Lake Winnebago in its middle course) into Green Bay, Lake Michigan, after a course of 250 m. By means of a canal, which connects it with the Wisconsin R., it forms a link of navigation between Lake Michigan and the Mississippi.

Foxtail Grass, the popular name of several species of grasses having soft, brushlike spikes of flowers, especially of the genus *Alopecurus*.



Smooth-coated Fox-terrier.

Fox-terrier, The. There are two varieties of fox-terrier, the smooth and the wire-haired. Their original duty in life was to bolt foxes when they took to earth; but as hounds were

bred lighter and faster, and the general speed of fox-hunting increased, the fox-terrier could not keep up with the chase, and he is now rather a friend and companion than a hunting-field dog. White, with handsomely disposed markings of either black or light tan, are preferred; and the weight should not exceed 20 pounds for show dogs. See R. Lee's *Fox Terriers* (4th ed., 1901); and books mentioned under Dog.

Fraction, in mathematics is the part of a whole expressed numerically. Let the whole be divided into n equal parts, and let m of these parts be taken together. This quantity, represented by $\frac{m}{n}$, is a fraction. If two quantities of the same kind have different magnitudes, the ratio of the smaller to the larger is the fraction which represents the part the smaller is of the larger. When the fraction can be represented by the ratio of two whole numbers, such as $7/22$, $113/355$, the quantities compared are said to be commensurable. But in many cases the quantities are incommensurable, and cannot be represented in terms of the same unit by two whole numbers, however large. Consequently the fraction cannot be represented as the ratio of two whole numbers.

In adding or subtracting fractions we must reduce them to the same 'name' or 'denominator.' Thus, $1/2 + 1/3 + 1/6 = 3/6 + 2/6 + 1/6 = 1$. When a fraction is expressed as a decimal fraction of more than one figure, we are really dealing with the sum of a series of fractions whose denominators are increasing powers of ten. Thus, $.125 = 1/10 + 2/100 + 5/1000 = 100/1000 + 20/1000 + 5/1000$. Hence the fraction means 125 thousandths parts; and each digit has a 'place' value exactly as it has in the number 125. Hence in adding decimal fractions we proceed as in whole numbers, adding together the digits which have the same place.

When the denominator of a fraction reduced to its simplest form contains as a factor any prime number other than 2 or 5, it cannot be expressed finitely as a decimal fraction. Thus, $1/3 = .3 + 1/30 = .33 + 1/300 = .333 + 1/3000$, and so on. We are dealing, in fact, with an infinite geometrical progression, each term being $1/10$ th of its predecessor. Similar results hold for the decimal forms of $1/7$, $1/11$, $1/13$, etc., but generally more complex.

When symbols are used in place of numbers, as in algebra, the conception of the fraction becomes generalized, but the same laws hold. Thus, to add together $\frac{a}{b} + \frac{c}{d}$, we must reduce to

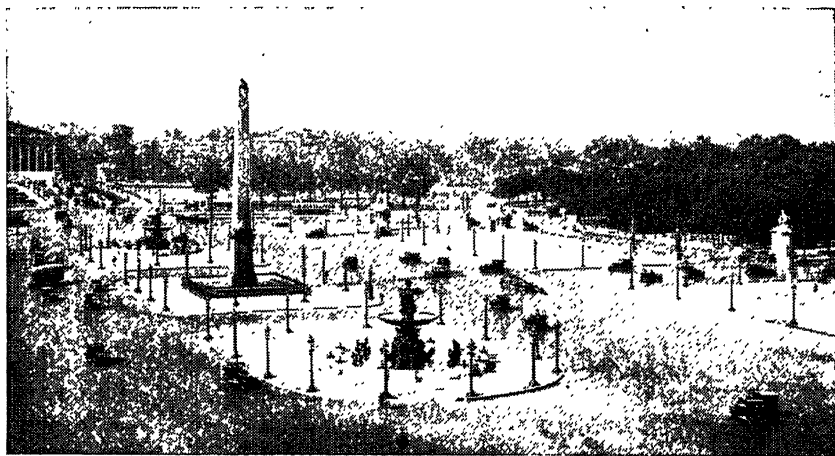
the same denominator, and then add the numerators. Thus, to add together $\frac{a}{b} + \frac{c}{d}$, we must reduce to

the same denominator bd —viz. $(ad + cb)/bd$. The ratio of the smaller to the larger of any two quantities of the same kind always gives a fraction, which may be a simple number or a complex number according to circumstances.

Fracture, in surgery, the term used for separation of the substance of a bone or, more rarely, of a cartilage. The predisposing causes which render bones specially liable to fracture may be local—necrosis or tumor affecting a single bone, or general—cancerous cachexia, the diseases called mollities and fragilitas ossium, and old age, all of which render the bones generally less able to bear a strain. The immediate cause may be either external violence

ing. The first end is attained by extending the broken limb and molding it with the hands; the second is opposed by the action of the muscles of the part which, pricked by the broken ends of bone and stimulated into painful spasms, tend to restore the deformity. Their action must be counteracted by the adjustment of some form of splint or external rigid apparatus to the limb, differing in material, shape, and method of application according to the seat of the fracture. See COLLES' FRACTURE; FIRST AID; also the articles on the different bones.

Fracture, in mineralogy, denotes the appearance of the broken surface of a mineral.



France: Place de la Concorde, Paris.

or muscular action. In the first case the fracture is usually transverse; in the second case, oblique. The chief symptoms are crepitation (except in impacted fractures), pain, swelling, and change in shape or position of the part affected.

In a simple fracture the bone is broken completely through, but, as a rule, only at one spot, without any special complication. In a comminuted fracture there are several small fragments or splinters. Compound fractures are distinguished by the protrusion of one or both broken ends through the skin or mucous membrane. An impacted fracture is one in which the broken extremities are forced into each other. The X-ray is the method now chiefly used in the diagnosis of fractures.

The object of the surgeon in setting a fractured limb is to place the fragments as nearly as possible in their natural relation, and to retain them firmly in this position during heal-

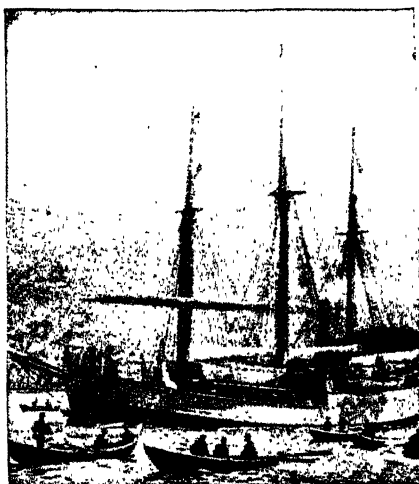
ing. It is distinct from cleavage, which is found only in crystallized substances. Fracture is defined as smooth, even, uneven, hackly, conchoidal, splintery, etc. Hackly fracture is characteristic of metals, such as cast iron or native copper. Conchoidal fracture is well seen in flint, which breaks with smooth, rounded, hollow surfaces.

Fra Diavolo (?1760-1806), the name popularly given to Michele Pezza, a native of Itri, and a celebrated Italian brigand. He served in the Neapolitan and papal forces; and became chief of a band of brigands in Calabria. Entering the service of the Neapolitan Bourbons in 1799, he proved himself a formidable antagonist to the invading French army. Auber's opera, which bears the name of *Fra Diavolo*, has no real connection with his story. Consult Amante's *Fra Diavolo* (1904).

Fragiacomo, Pietro (1856), Venetian painter. His works are chiefly landscapes and

marines including many views of the lagoons.

Fragonard, Jean Honore (1732-1806), French painter and engraver, was born in Grasse, Provence. He studied under Chardin and Boucher; and gained the Prix de Rome in 1752. Among his many works are a series of panels—*The Romance of Loe* painted for Mme. Du Barry, later purchased by J. P. Morgan and exhibited in the Metropolitan Museum, New York City. His work is spontaneous and graceful, his color exquisite, his treatment of landscape sympathetic.



The Fram.

Fram, three-masted wooden schooner, built in 1892 for Nansen's Arctic expedition; and used also by Captain Amundsen on his Antarctic expedition in 1911. In 1895, under Nansen, the *Fram* reached latitude 85° 57' n., and in 1911, under Amundsen 78° 34' s., thus gaining the distinction of having reached the farthest north and the farthest south of any ship.

The outside planking of the vessel was in three thicknesses, varying from 24 inches up to 28 inches. She was 117 feet long, and had auxiliary engines working a screw propeller, the motive power being supplied by an 80-horse-power Diesel petroleum engine. See ANTARCTIC EXPLORATION; ARCTIC EXPLORATION.

Frame, the outline or skeleton of an object, as the frame of a picture or mirror, or of a house or ship. Picture frames came into use in the 16th century, and were at first elegantly carved. The art of making frames for mirrors

reached its perfection in France in the 18th century. The covering of a pit used for protecting plants is called a *cold frame* (see HOT-BED). See also STEEL AND IRON CONSTRUCTION; SHIPBUILDING.

Framingham, town, Middlesex co., Massachusetts. The town has a State normal school—the first in the United States, established at Lexington in 1839. Framingham is the seat of manufactures, which comprise rubber goods, boots and shoes, boilers, leather goods, and stationers' supplies; p. 23,214.

Frampton, Sir George James (1860-1928), English sculptor. He gained the grand medal of honor at the Paris Exhibition of 1900. A leader of the 'new movement' in English sculpture in its structural 'polychromatic' and decorative character, his best works are the ivory, bronze, and jewelled *Lamia*; the bronze Mitchell Memorial (Newcastle); the frieze in St. Clement's (Bedford); and numerous memorials of Queen Victoria.

Franc, a French coin which has been current at different periods—the earliest having been made in 1360, of gold. The present French franc is a silver coin, dating from 1799. A piece of similar value, and bearing the same name, exists in Belgium and Switzerland; while the various Latin countries have coins corresponding in value, but of different names. The *franc* is divided into 10 *décimes*, each of these being subdivided into 10 *centimes*. The *décime* is little used, but the older *sou*, worth 5 *centimes*, is still in common use. The franc piece weighs 5 grammes, .335 fine. See MONEY.

France, a country of Western Europe, between latitudes 51° 5' and 42° 21' n., and longitudes 4° 42' w. and 7° 39' e. It is bounded on the north by the English Channel, the Strait of Dover, and the North Sea; on the northeast by Belgium and Luxemburg; on the east, by Germany, Switzerland, and Italy; on the south, by the Mediterranean Sea and Spain; and on the west by the Bay of Biscay, Atlantic Ocean, and English Channel.

The superficial area of France is 212,644 sq. m., including the provinces of Alsace and Lorraine (see ALSACE-LORRAINE) taken by Germany in 1871, but restored to France by the Treaty of Versailles (1919), and the island of Corsica (3,367 sq. m.).

The continental frontiers of France on the east are quite arbitrary; to the northeast the Vosges and the Jura constitute a natural defence and boundary; while on the southeast and southwest, respectively, the Alps and Pyrenees, both difficult to traverse, form fron-

tiers which are, in the true sense, natural and geographical.

The shores of France are washed by deep seas, with the exception of the Channel, which is of recent formation. France has a considerable length of coast line in proportion to its superficial area; and of a total frontier of 3,250 miles, 1,760 front the sea. The general shape of the country is hexagonal, and of the six sides three are maritime—the northwest (Channel), the west (Atlantic Ocean), and the southeast (Mediterranean). These coasts assume a widely different physical character, according to the regions of which they form the seaboard. In some parts they are rocky, cut up into islands, peninsulas, and bays, as in Brittany and Cotentin (Normandy), or with shores of high chalk cliffs, as in Caux. In other parts they are low, flat, and sandy, their littoral being bordered with dunes and marshes (the coasts of Landes and of Bas-Languedoc). Beyond the delta of the Rhône, the Alps and their offshoots extend to the sea, and send out a series of capes and rocky promontories, which leave between themselves and the shore nothing but a narrow 'Riviera,' a characteristic feature of the Mediterranean countries.

The principal highlands of France are the Central Plateau, the Alps, the Jura, and the Pyrenees. The extensive mass of elevated plains, forming the Central Plateau, reach a height of from 3,000 to 4,000 ft. in its higher central parts only; while the river valleys are dug so deeply into the plateau that it often assumes a hilly aspect. Since the annexation of Savoy in 1860 the Alps of Savoy, as well as a portion of the main chain, including the northern slopes of the chain of Mont Blanc belong to France. The pass of Little St. Bernard (7,190) separates the latter from the Graian Alps, which have the two passes of Mont Cenis (6,883) and Mont Genève (6,802) leading from France to Italy. The Pyrenees extends for a length of 260 m. between the Atlantic Ocean and the Mediterranean Sea. In the east it is built up of three parallel chains running in a northeast direction. Farther west the Pyrenees consist of at least two parallel chains of the wildest aspect, both running northwest and disposed in *échelons*. Here we find the highest peaks of the Pyrenees: Nethou (11,168) in the Maladetta chain, the Mont Perdu, and several others rising to heights of over 10,000 ft.

The hydrographic basins are likewise a result of the geological structure, and they in general correspond to the basins above men-

tioned. (1) The Seine (480 m.) corresponds to the basin of Paris, the structure of which accounts for the converging direction of the principal tributaries—the Yonne, Marne, and Oise—toward the center of the basin. Its singularly calm and regular course is explained by the moderate rainfall, by the permeability of the soil, and by the gentle slope. (2) The course of the Loire is 620 miles. Its irregular flow, its terrible floods, and the sandbanks which obstruct it make it quite unfit for navigation. (3) The Garonne (404 m.) corresponds to the basin of Aquitania. It is also, owing to the clearing of the Pyrenean forests, subject to disastrous floods; while the sediment which it carries away obstructs the passages of the mouth. (4) The Rhône (500 m.) is formed by the union of Alpine rivers (the Rhône of Valais and the Arve), which have summer augmentations, caused by the melting of glaciers, and of a quiet river of the plain—the Saone, which has autumn and winter augmentations, acting as a balance to those of the Alpine rivers. But the torrents in the Cévennes flow down steep slopes, and thus destroy this equilibrium. The Rhône has by far the greatest volume of French rivers, discharging as much water as all the rest put together; and the problem of its economic utilization is one of the most important in France. The only lakes of importance are found in the Alps. The largest is Lake Geneva on the Swiss border, belonging in part to Switzerland.

In almost its whole extent France is subject to oceanic influences, and has thus a climate of damp warmth. Westerly winds predominate, and give to Brittany 160 to 180 rainy days annually, and 150 even to Paris. These rains are, however, so fine and impalpable that, though they are accompanied by perpetual mists, they give only an annual rainfall of 23.6 inches at Paris. The 'mistral' blows with much constancy and force from the central plateau upon the Mediterranean coast. Though often violent and always chilling, its effect is in the main beneficial. The rainfall is greatest on the coast and in the mountain regions, and least on the northern plains.

Forests are under the supervision of the Minister of Agriculture. Their area is about 18 per cent. of the total surface of the country, and about one-third of them are under public ownership. The principal forests are Ardennes, Compiègne, Fontainebleau, and Orléans, consisting chiefly of oak, beech, elm, and chestnut, and the cork tree in the south.

Stock Raising.—In 1937 there were in

France 3,048,000 horses, mules and asses; 15,755,000 cattle; 6,994,000 sheep; 1,447,000 goats; and 7,117,000 pigs.

Fisheries are of great importance, the production for a year was valued at 722,561,000 francs. The chief products of the inshore fisheries are sardines, herring, mackerel, tunny, fish, lobsters, and anchovies and sprats.

Mineral Resources and Mining.—The most important mineral products of France are coal and iron, though zinc, lead, copper, manganese, nickel, antimony, aluminum, tungsten, gold, silver, asphalt and sulphur are found. The country is rich also in all kinds of building stone, gravel, chalk, and plaster, while the shales and phosphates are produced on a large scale, and supply agriculture with chemical manure.

Coal and lignite are mined chiefly in the departments of Pas de Calais, Nord, Loire, Gard, Saone-et-Loire, Aveyron, Tarn, Bouches-du-Rhône, Puy-de-Dôme, and Allier. The regaining of Lorraine by the Treaty of Versailles materially increased the French coal resources, the mines of that province having an annual output of at least 4,000,000 tons. France's iron output was practically doubled by the restoration of Lorraine. With the mines in that district France has now approximately 5,630,000,000 tons of potential iron reserves, with an annual production of 43,000,000 tons, exclusive of 2,000,000 available from Tunis and Algeria. Of this amount 21,000,000 come from the Lorraine iron districts, 20,000,000 from the Longwy-Brie district, and 2,000,000 from Normandy and other parts of France. Production of the chief minerals in 1937 was, in metric tons: coal, 44,319,000; iron ore, 37,772,000; bauxite, 688,000; pyrites, 146,000; potash, 490,000. Armament demands speeded production in 1938-39.

Agriculture has made great strides during the last hundred years. Waste lands, moorlands, commons, and heaths now take up less than 8 per cent. of the agricultural soil. According to the most recent statistics available, of a total area of 136,101,760 acres, 84,053,175 acres were under crops, fallow, and grass; 24,710,440 acres under forests; and 11,786,200 acres moor and uncultivated land. Cereals, the vine, beets, potatoes, fruit, and nuts, are cultivated—the two chief products, which have set their mark on the character of the French peasant, being wheat and the vine.

The cultivation of wheat has developed both as regards the superficial area of the land occupied and the yield per acre, which, from 11 bushels at the beginning of the 19th century,

reached an average of 20.08 bushels in 1917. Since the War, owing to the terrible devastation of cultivable land, that figure has been somewhat lowered. The most intensive agriculture is carried on in the basins of the Seine, the Garonne, the upper Saône, and the middle Allier. The harvests of 1937 were, in metric tons, as follows: wheat, 7,017,000; barley, 1,016,615; oats, 4,346,598; potatoes, 15,911,379; and sugar beets, 8,666,000.

The vine, which is replaced in Normandy and Brittany by the apple (for cider), and in the northeast by hops (for beer), was hard hit for some years by the ravages of phylloxera. But the French vine grower has struggled with admirable perseverance against this scourge, and vine growing is again a flourishing industry. The wine production from about 3,500,000 acres of vineyards in 1937 was 1,357,236 U. S. gallons. The vine flourishes in six departments of the Mediterranean coast (the Midi): the basins of the Garonne and the Charente, in the southwest; the valley of the Rhône, Beaujolais, and Bourgogne in the east; and the region of the middle and lower Loire.

Cider production is also of importance, having reached 240,234,000 gallons in 1930; while the manufacture of wine from raisins and from the residuum of grapes meets a large local demand. Fruit trees abound. The annual harvest includes apples and pears, chestnuts, walnuts, olives, peaches, apricots, cherries, plums, and currants.

Silk production is carried on with Government encouragement, most extensively in Gard, Drôme, Ardèche and Vaucluse. The flowering bulb industry has recently assumed considerable importance in Southern France, where about 1,000 acres are devoted to the purpose. Exports of bulbs to the United States amount to \$200,000 annually.

Manufactures include textiles, of cotton, silk, linen, and wool, metal works, sugar works, chemical industries, potteries, paper mills, and a great variety of industries connected with furniture, clothing, and the like. The industrial centers are grouped principally around the coal basins, on account of the low price of fuel, or around the seaports, where English coal is landed. The chief groups are those of the north, of Lyonnais, of Paris, and of Nancy. Industry is now spreading more and more in the high Alpine valleys—due to the utilization of natural motive power.

Hundreds of small industries, which occupy two-thirds of the French industrial workers, are especially worthy of note, since in them

the artistic taste and inventive genius of the nation are especially apparent. For such small industries Paris is the world's emporium.

Communications.—As a consequence of its general situation, and of the peculiar arrangement of its valleys, France has always been well equipped with highways for traffic. The great network of Roman roads was completed by Colbert and Napoleon, and is unequalled in the world. Railways are under state control, and some of them are owned by the government. There are also lines of local interest subventioned by the state or by the departments. France has about 26,000 miles open for

lected in favor of railways. The busiest canals are those of the north, and those which join the north to Paris and the lower Seine, which is itself a highway of active navigation. The port of Paris has a tonnage equal in importance to that of Marseilles.

Government.—The French Government was republican in form from Sept. 4, 1870 to June, 1940. Its constitution dates from 1875. The legislative power was vested in a National Assembly, composed of the Chamber of Deputies, elected for four years by direct suffrage, and the Senate, elected by an electoral body composed of (1) delegates chosen



France: A Rural Scene.

traffic. All the principal lines start from Paris, and run toward the large towns. There are six great systems, the Northern, the Eastern, the Paris-Lyons-Mediterranean, the Southern, the Paris-Orléans, and the Western.

On Jan. 1, 1939, there were 48,000 m. of national roads and 330,000 m. of secondary roads. There is radio-telephone service between Algiers and Paris.

In October, 1933, the five French commercial air lines were united into one government-controlled company. They had reported for 1937 a mileage flown of 6,562,922 m.

The waterways have been somewhat neg-

by the municipal council of each commune, and (2) deputies, councillors-general, and district councillors of the department. The President, elected for seven years by the National Assembly, and the Ministry constituted the executive power. A special body, introduced by Napoleon 1., the *Council d'Etat*, presided over by the Minister of Justice, and composed of Councillors, *Maîtres de Requêtes*, and auditors appointed by the President, advised upon administrative points. The Ministry was selected by the President, chiefly from the National Assembly, although not necessarily so.

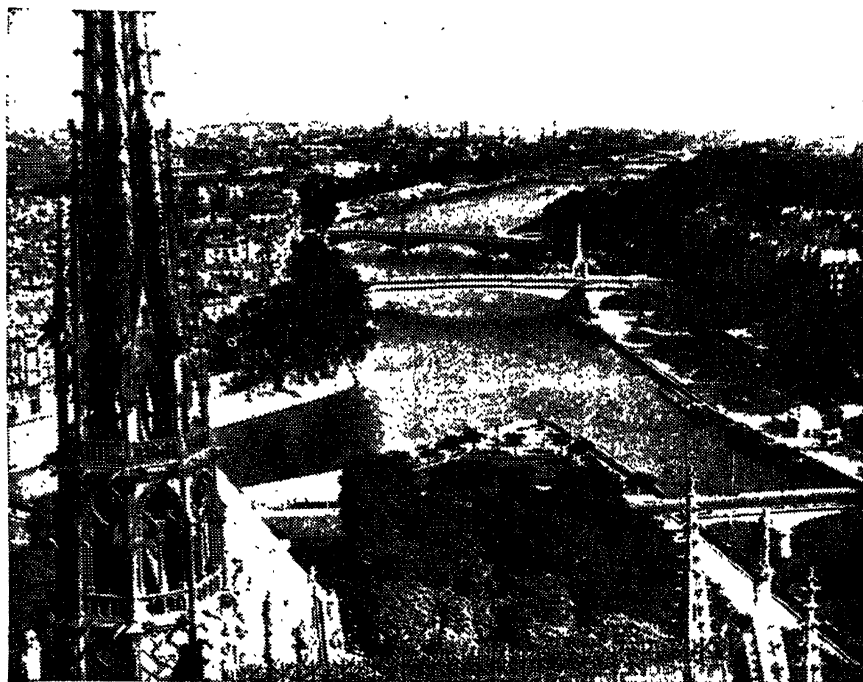
For purposes of local government France is

divided into 87 departments and the 3 departments of Algeria. The departments are subdivided into Arrondissements (279 in 1927), Cantons (3,019), and Communes (37,903). A prefect, nominated by the government, was in charge of each department; there are sub-prefects for the arrondissements; the commune is under charge of a municipal council elected by direct suffrage. The canton contains an average of 12 communes; it is the seat of the justice of the peace.

The colonies, politically a part of France, were represented in the Senate by 4 Senators, and in the Chamber of Deputies by 10 Dep-

French Sudan and Upper Volta; Guinea; Ivory Coast; Dahomey; Mauritania; Niger; Congo; Cameroon; Togo; Somali Coast and dependencies; Madagascar and dependencies; Mayotte; Réunion. In America—Martinique; Guadeloupe and dependencies; Guiana; St. Pierre and Miquelon. In Asia—French possessions in India (capital, Pondicherry); Indo-China; Cochín-China; Tonking; Annam; Cambodia; Laos; Syria. In Oceania—New Caledonia and Loyalty Islands; Marquesas; Society Islands; Tuamotu; Austral Archipelago or Tubuai Islands.

By a convention with Germany (Nov. 4,



Scene in Paris.

uties. Those not represented in the National Assembly were for the most part represented in the *Conseil Supérieur des Colonies*, consisting of colonial officials. With the exception of Algiers and Tunis, the colonies were all under the administration of the Minister of the Colonies. Algiers was under the Minister of the Interior; Tunis was under the Minister of Foreign Affairs.

The French colonies and dependencies cover an area of about 4,696,001 sq. m., and are as follows: In Africa—Algeria; Tunis; Senegal;

1911), France, in return for concessions to Germany in French Equatorial Africa, received exclusive rights in Morocco (except the Spanish coast line). A treaty with the Sultan agreeing to a French protectorate was signed in March, 1912. (See MOROCCO.) Over a superficial area of 212,659 sq. m., France possesses 42,000,000 inhabitants.

No religion is officially recognized, the law which went into effect on Dec. 11, 1906, having abolished the Concordat and separated the church from the state. This law, which

authorizes all creeds to form associations for public worship, compels them to support themselves and provides for pensioning the clergy as a transitory measure, and for turning over places of worship and ecclesiastical dwellings to the associations. The law of 1907 makes further provision respecting the surrender of ecclesiastical buildings, and has been the cause of much controversy, the Roman Catholic clergy refusing to recognize the fact of separation.

The total Catholic population is placed at 37,000,000. Protestants (the Reformed or Calvinistic Church, and the Lutheran), located mainly in the center and south and in Paris, number about 1,000,000. Jews, located principally in Paris, Bordeaux, and the east, total 68,000. Under the act of July 1, 1901, all religious communities must be authorized by the state and no monastic association can be authorized without a special law. Prior to the passing of this law there were 910 recognized associations and 735 not recognized. There are 17 archbishops of the Roman Catholic Church.

Education is compulsory and free between the ages of five and thirteen. Primary schools are divided into four classes—infant (for children between the ages of two and six), elementary primary (for children between six and thirteen), higher primary, and primary technical schools. Secondary schools consist of state lycées, communal colleges, and private establishments; the course of study is for seven years. Higher education institutions are special schools and universities, state and private. Teachers' salaries, except in towns of more than 150,000 inhabitants, are paid by the state. See EDUCATION SYSTEMS; NATIONAL.

France has a highly developed system of agricultural education, centering in the Agronomic Institute at Paris. There are three other national schools of agriculture (Grignon, Rennes, and Montpellier); a school of horticulture at Versailles, of Colonial Agriculture at Nogent-sur-Marne, of agricultural industries at Douai, and of dairying at Mamirolle. The system also includes about 46 local practical schools and a dozen model farms, together with experiment stations, public lectures, and agricultural courses given in most of the universities.

Among the large scientific institutions are the Collège de France, Museum of Natural History, National School of Mines, Agronomic Institute, Ecole Normale Supérieure, Ecole Pratique des Hautes Etudes, Ecole des Chartes, the Institut de France, the highest institution

of learning, formed from the five academies—the Académie Française, Académie des Inscriptions et Belles Lettres, Académie des Sciences, Académie des Beaux-Arts, and Académie des Sciences Morales et Politiques.

Army and Navy.—The French army proper in time of peace was stationed in France, Algeria, and Tunis, and was known as the Metropolitan Army; the Colonial Army, made up of white and native troops, was stationed in France and the French colonies.

Military service in the Metropolitan army was compulsory and universal, but since 1923 liberal exemptions were allowed; liability to service extended from the ages of 21 to 48. The term of service in the ranks of the first line, or active army, was one and a half years. The soldier then, after 2 years on furlough, belonged to the reserve for sixteen and a half years; after which he passed to the second reserve for eight years. In peace time the Metropolitan army numbered about 590,000. Service in the Colonial Army was by voluntary enlistment and the peace strength was about 317,000.

The *Gendarmerie* is a police force recruited from the army but performing civil duties in time of peace. It includes the *Garde Républicaine* which performs police duty in Paris. The strength of the former is about 20,000; of the latter, about 6,300.

During the Great War (1914-18) the mobilized forces of France numbered 7,500,000. Casualties numbered 4,506,600—1,385,300 dead, 2,675,000 wounded, 446,300 prisoners or missing.

The country is strongly fortified, particularly along its eastern frontier. Verdun and Toul guard the passage between the Ardennes and the Vosges; Belfort holds the Burgundian gate between the Vosges and the Jura; Grenoble commands the Alpine routes from the valley of the Po; and the former German fortresses of Strassburg, Metz and Thionville are on the eastern frontier.

Military aviation has been extensively carried on in France. In 1938 there were about 1,900 first line military aeroplanes in service and the number increased slightly in 1939.

The Navy was under the direction of the Superior Council of the Navy (reorganized 1909), presided over by the Minister of Marine. It is recruited partly from the army, partly by voluntary enlistment, and partly by conscription from seafaring men between eighteen and fifty years of age.

The French navy in 1939, including ships under construction, consisted of 11 battleships, 3 aircraft carriers, 10 cruisers, 12 light

cruisers, 77 destroyers, 18 torpedo boats, 93 submarines and 111 miscellaneous craft; personnel 77,500.

Peoples.—The French people present a certain homogeneous character due to the slow fusion of various races going on since the Stone Ages, when Gaul was a chief center of Palæolithic and Neolithic culture. In remote times the south was occupied by Iberians and Ligurians from North Africa, and all the land north of the Garonne by Celts from Central Europe. These were followed in the historic period by Phœnicians from North Africa; Greeks from Asia Minor; Romans, the great civilizers, from Italy; Teutons (Visigoths, Burgundians, and Franks) from Germany; and Norsemen from Scandinavia—all in the order named.

Apart from a few Basques and Flemings in the extreme south and north, the Celts alone survive as a distinct race in Brittany, where they were reinforced in the 5th century A.D. by their Cymric kinsmen from Britain. All the rest were merged in the Gallo-Roman nationality of pure Neo-Latin speech, with two marked divisions—*langue d'oc* in the south, and *langue d'oïl* north of the Loire.

History.—As early as the sixth century B.C. the colony of Massilia (Marseilles) was founded by Phœnicians, and subsequently peopled by Greeks; and the natives of the interior learned from the newcomers something of the commerce and arts of the more civilized countries of the Mediterranean. The inhabitants, too, of what we should call France were closely akin to those of the Po Valley, and from 218 B.C., when Hannibal crossed Southern Gaul, the relations of the Gauls with Rome were frequent. Eventually Southern Gaul became a Roman province.

In 58 B.C. Cæsar was appointed to the command of the southern province, and was soon drawn by circumstances and his own ambition to interfere in the interior. For Gaul was threatened by invaders—this time the Helvetians; while on the upper Rhine the Germans, under Ariovistus, were menacing the security of the country. Cæsar forced the Helvetians to retire, and at Vesontio (Besançon) he inflicted an annihilating defeat on the dreaded Germans. Then in a series of campaigns, which are among the most brilliant in history, and are described by himself with extraordinary lucidity and power, he procured the nominal submission of the whole country.

In the year 180 (which may be taken as marking the end of the tranquil period of the Roman empire) no province stood higher in

culture, prosperity, and order than Gaul. But the following centuries were for it, as for the rest of the empire, a time of violent confusion and rapid transition: the two chief forces on which the future of the country depended were the Christian Church and the barbarian invasions. Visigoths and Ostrogoths, Vandals, Burgundians and Lombards, Alemanni, and others passed through the land, and effected settlement, usually of a transitory kind.

In 476 the Western Empire of Rome ended, and Gaul was forced to work out her own destiny. That destiny was to be largely influenced by the Franks, a people of Germanic stock, who were destined to become the leading military and political agent in the plains of Northern Gaul and to give to France its name and its first dynasty of kings—the Merwings or Merovingians. Chlodwig (Clovis, Louis) became king of the Salian Franks in 481; and he defeated in turn the Romans (486 A.D.), the Ripuarian Franks, and the Alemanni. But the really decisive event for himself, his dynasty, and his race was not military, but religious. In 496 he accepted Christian baptism at Rheims, at the hands of St. Remigius. The union between the French royal house and the papacy all through the Middle Ages was of the closest description, and it is difficult to say which side gained most from the union.

The last half of the 6th and the first part of the 7th centuries are for the Frankish kingdoms a period of violent confusion. Meanwhile power was slipping from the Merovingian kings. They were, for the most part, weak in body and mind, and their servants and ministers made themselves first independent, then supreme over them. Regularly, for many reigns, the kings reigned and the mayors ruled, until at length the phantom monarchy seemed no longer worth preserving, and the mayors of the palace themselves founded a dynasty, the Carolingian, that eclipsed the Merovingian.

Pepin, Grimoald, Ebroin are among the most important mayors of the palace. But the great founder of the Carolingian line was Pepin of Héristal (687-714). He was the first to make real progress in the introduction of Christianity among the Germans across the Rhine. He was succeeded by Charles Martel (717-741). The latter was mayor of the whole of the Frankish territory, and brought it to a much higher grade of order, discipline, and unity than it had yet attained. But the Frankish power and all Christendom was threatened by the startling advance of the Mohammedan power from Spain. In 732 Charles met them, and in the epoch-making Battle of Poitiers or Tours

dealt them a blow from which their power in the west never really recovered.

But Charles Martel, strong as he was, did not dare, or did not care, to sweep away the phantom kings. His successor, Pepin (741-768), did, however, take this inevitable step. In 751 the pope readily gave Pepin permission himself to claim the royal title.

In 768 Pepin's son Charles succeeded to the throne (768-814). Charles the Great or Charlemagne raised to the zenith the power of the Franks in Western Europe, and brought Germany finally into the circle of European civilization. He introduced a far better organization of government than anything the world had known since the fall of the Roman empire—and this is the basis on which most continental states have been built. In fact, he founded the mediæval empire. (See CHARLEMAGNE.)

On the appeal of the pope Charlemagne conquered Lombardy, and took the title of 'Charles, king of the Franks and Lombards, and patrician of the Romans.' In a long series of campaigns he broke the Saxon power and incorporated it with his dominions. He conquered, in person, or through his generals, Bavaria, the northern Slavs upon the Baltic, the Avars of Hungary, and the Mohammedan dynasty of Spain. On Christmas day 800 he was crowned, in St. Peter's at Rome, by Leo III., and hereafter styles himself 'Emperor of the Holy Roman Empire.' This, the best-known incident of his life, was a step of the most doubtful value; the connection between the empire and Italy proved a danger to both. But it had little influence upon the future history of France.

Although the influence of the great Charles's work was permanent, yet signs of disruption were plentiful during the reign of his successor, Louis the Pious; but on his death, in 840, the tendency became irrepressible. In 843 the treaty of Verdun partitioned the empire of Charles among three claimants. Another Charles was to have the west, which is henceforward properly known as France. Louis took the east, which subsequently grew to be Germany. Between them was erected the middle kingdom of Lotharingia (Lorraine).

The century and a half from 843 to 987 is a period of great obscurity and confusion. The Danes attacked at various points, penetrating up the Loire, the Seine, the Garonne, the Scheldt. Paris was attacked by the Northmen in 885, and though they were driven off from that city, they made themselves masters of many other places, such as Rouen, Bordeaux

and Aix-la-Chapelle. In 912 the treaty of St. Claire-sur-Epte ceded to them Normandy, where their successors were destined to play so great a part. As the power of the monarchy decayed, the feudal powers of the great nobles developed, and the authority of the monarchy became merely nominal. In 987 the most important of these noble families forced itself on to the throne, in the person of Hugh Capet. With him the third French dynasty begins. But for more than a century its fortunes were very obscure; the reigns of Hugh Capet (987-996), Robert II. (996-1031), Henry I. (1031-60), Philip I. (1060-1108) call for no remark here.

With Louis VI. (1108-37) a decided upward movement is perceptible. The long reign of Louis VII. (1137-80) is comparatively inglorious. He was well served by the Abbot Suger, but his energy was chiefly thrown into the crusades; and he inflicted a really serious blow on the prospects of the French monarchy when he divorced his wife, Eleanor of Aquitaine, and allowed her and her dominions to pass into the hands of Henry II. of England.

But France was saved from the peril by Philip Augustus (1180-1223), who was one of the chief founders of the French monarchy. By subtle diplomacy and bold fighting (the battle of Bouvines, 1214), he expelled the English king from Brittany, Normandy, Maine, Anjou, Touraine, and most of Poitou. This was the principal event of his reign; but, at the same time, the internal organization of France was rendered more effective by the emancipation of the towns from the feudal yoke, by the better organization of a central administration of law, and by the rapid growth of the University of Paris. Paris became decidedly the most important city in Europe. The policy of Philip was prolonged into the short reign of his successor, Louis VIII. (1223-6), and then came Louis IX. (St. Louis; 1226-70). This reign is the real culmination of the mediæval monarchy of France. Louis was only nine years of age on his accession, and during the first years of his reign France was under the guidance of his mother, Blanche of Castile. Few young women have shown greater powers of statesmanship than she. Louis himself furnishes one of the instances, rare in history, where the highest qualities of the soldier and statesman are linked with a sensitive conscience, deep piety, and unsullied honor. He kept a firm hand on the turbulent power of feudalism, and even when the nobles were joined by Henry III. of England, he beat them without difficulty. His internal reforms were very numerous. The most important was

the development of the Parliament of Paris, a great legal corporation, henceforward the chief agent of the crown in combating the nobles. He also prohibited judicial combat, and the right of private war; he systematized the organization of France, both central and provincial. The university of Paris rapidly developed during his reign, and the Sorbonne (the theological faculty of the university) was founded by him; and such great scholars as Roger Bacon and Thomas Aquinas were attracted to Paris and taught there. Twice he was induced to embark on the crusading movement. His great crusade took the form of an attack on Egypt, which was at first successful, but in 1250, at the battle of Mansorah, ended in a huge disaster. In 1270 he led an attack against Tunis, and there died of pestilence.

Philip III. ('le Hardi') succeeded (1270-85). The chief event of his reign was the destruction of the French power in Sicily. But when Philip IV. ('le Bel') mounted the throne in 1285, one of the most important reigns in European history commenced. A ferocious energy and egotism that grew with success are the most obvious features of his character. The chief incident of his early reign was the war with Flanders. In 1300 this rich district was annexed to the French crown; but the exactions of Philip IV's lawyers forced Flanders to rebellion in 1302. In 1304 Philip had to accept a treaty whereby all Flanders beyond the Scheldt was abandoned.

Before this war was over, Philip's quarrel with the papacy over the comparative powers of pope and king in the management of the church, had begun—a controversy in which Philip was excommunicated by Boniface but regained his power by procuring the election of Clement V. who not only withdrew the bull of excommunication, but consented to take up his residence at Avignon (1309). During his struggle with the papacy Philip relied on the support of the States-general, now summoned for the first time to represent the three orders of estates of the realm (1302).

Philip's reign seemed to mark the zenith of the royal power, but it was the prelude to a very rapid decline. Philip's three sons, Louis X., Philip V., and Charles IV., reigned in quick succession, and all died without male issue. A disputed succession was the result. Edward III. of England claimed the throne as son of Isabella, daughter of Philip IV., and thus the Hundred Years' War (1337-1453) began. In its first period, 1337-1360, England gained, and the disasters of the war stirred up a violent revolutionary movement in which the power

of the States-general increased and that of the monarchy declined. The condition of the country at large, and especially of the peasantry, was deplorable.

Charles V., who reigned from 1364 to 1380, was fortunate in finding a commander of genius in Du Guesclin, and by the end of his reign he had worn down the English, reduced their power to very narrow limits, and even retaliated on the coasts of England. Charles VI. (1380-1422) was only twelve years old on the death of his father. In 1392 he became mad, and the exercise of power was disputed between the Orleanists (or Armagnacs) and the Burgundians, with the utmost bitterness and ferocity. It was under such circumstances that Henry V. of England won the battle of Agincourt in 1415; and in 1420, by the treaty of Troyes, it was agreed that he should marry Catherine, the daughter of Charles VI., and inherit the throne of France after the death of her father. The national cause was still maintained south of the Loire by Charles VI.; but it was torn with dissensions, and the outlook seemed hopeless. Then the year 1422 cleared away the two great enemies of France—namely, Henry V. and her own imbecile king.

Charles VII. (1422-61), in whose reign the salvation of France was accomplished, contributed little to it, and is unworthy to have his name associated with it. The quarrel between Burgundy and the monarchy was patched up; the English government was weak and vacillating. Then came that miracle of history, Joan of Arc. The siege of Orleans was relieved in 1429; the illustrious maid was put to death in 1431, and the clouds were still thick round France. But in 1450 the English were driven out of their last stronghold in Normandy; in 1453 the last blow in the war was struck in Castillon, near Bordeaux, and France was mistress within her own boundaries again. France had suffered terribly during the English wars. It needed a strong will and a not too scrupulous arm to restore order and health to the commonwealth, and in Louis XI. (1461-83) France had both. He crushed the great nobles, strengthened the Parliament of Paris and established provincial parliaments, encouraged industry, welcomed the invention of printing, and did much for art and letters in France.

Louis XI. was succeeded by his son, Charles VIII. (1483-98). One solid advantage accrued to France from his reign: by his marriage with Anne of Brittany (1491) that province was annexed to the French crown. But the chief fact of his reign is that he put forward a

specious claim to the kingdom of Naples, and in 1494 crossed the Alps to enforce it. This date is often taken as the beginning of modern history; for the French attack on Italy upset the European state-system and brought into existence the idea of 'balance of power,' while it synchronized, or nearly so, with the discovery of the New World, the culmination of the renaissance, and a very marked decline in the authority of the papacy. Charles VIII.'s expedition into Italy was at first brilliantly successful. Naples was reached and occupied; but then the subtle Italians combined against the French king; his conquests were lost, and he escaped with difficulty from Italy.

In 1498 Louis XII. succeeded to the throne. He continued the expeditions into Italy, which resulted finally in 1513 by defeat and the expulsion of France from the borders of its southern neighbor. His reign was a successful and prosperous one at home; but his Italian wars were even more dangerous than those of Charles VIII. Nor had defeat fallen on France in Italy alone; the Spaniards and English had invaded France and had gained victories. Peace came in 1514, and the king's death in 1515.

His nephew, Francis I. (1515-46), succeeded. France and Spain were already jealous rivals, but in this reign they entered upon a struggle which lasted, as a permanent feature of European war and diplomacy, for nearly two hundred years. Francis took up the Italian adventure. He crossed the Alps in 1515, and gained a great victory over the Swiss and Milanese at Marignano. The battle not only raised France and the French king to a great pitch of military glory, but also produced the arrangement with the pope which is known as the Concordat of Bologna, whereby ecclesiastical appointments in France were, in effect, left in the hands of the king. In 1519 the Emperor Maximilian died, and both Francis and the Spanish king, Charles, became candidates for the imperial crown. When Charles was elected as Charles V. (July, 1519), his defeated rival prepared for war against him; and this war, in spite of short truces, is the chief fact of the remainder of the reign.

Francis I. died in 1546, and was succeeded by his son, Henry II., and the struggle soon began again. Charles V. attacked Metz in 1552, and his repulse from before its walls was reckoned a deep humiliation for him. Charles abdicated in 1556, and was succeeded (in the Spanish throne, but not in the empire) by Philip II. The French were very sharply defeated at Saint Quentin in 1557, but Francis of

Guise, the successful defender of Metz, captured Calais from the English allies of Philip in the following year; and at last the period of the Italian wars was really closed by the peace of Cateau-Cambrésis (1559). France accepted defeat and abandoned Italy; her chief compensation was the recognition of her claim to the three bishoprics (Metz, Toul, and Verdun) upon her eastern frontier. Henry died in the same year.

The reformation now became the chief influence in France, as in other European countries. Francis I. had at first been favorable to kindred movements of the renaissance and the reformation; but later sought to conciliate the pope and the church by persecuting Protestantism in its various forms. The same policy was carried on by Henry II. But in spite of all Protestantism grew; it took, not the moderate form of Lutheranism, always ready to cling to the support of the secular powers, but the aggressive and exclusive form of Calvinism. The marked feature of the Protestant movement in France was the very large proportion of nobles who gave their adherence to it—some, like Coligny, attracted by genuine devotion, others welcoming it as a screen for resisting the crown. The Catholics were often militant, and gathered round the family of the Guises—a family of Lorraine origin, but long naturalized in France. The chief members were Francis the duke and Charles the cardinal. The queen-mother, Catherine de' Medici, tried to trim between the two. Her children, the successive kings of France—Francis II. (1559-60), Charles IX. (1560-74), and Henry III. (1574-89)—were of little real influence.

The religious wars, which lasted with little intermission for thirty years, began in 1562. Europe has seen few more destructive struggles. Neither side was strong enough to destroy the other; the Protestants were uniformly unsuccessful in battle, but could still maintain the struggle; then at last the idea of toleration, at first acceptable to neither party, came to the front and triumphed. Between 1562 and 1570 three wars were fought, separated by illusory edicts of toleration. But in 1570 the young king, Charles IX., drew near to Coligny, and an entirely new policy was planned. Protestant and Catholic were to unite in a war against Spain, which was then engaged in an attempt to crush the Netherlands. This was the policy which France finally adopted and which brought her to greatness. But for the present it offended too many interests. The Guises joined with Catherine de'

Medici, and determined first to kill Coligny, and afterwards to carry out a general massacre of the Protestants. But this St. Bartholomew massacre (Aug. 24, 1572), though it destroyed many thousands of Protestants, did not annihilate the party, and the war went on.

Charles ix. died in 1574, and was succeeded by his brother, Henry iii., but the monarchy lost all control over the country. There were soon three definite parties in France—(1) the Politiques, a new party formed from the old Huguenot party and those Catholics who were willing to accept religious toleration (this party after 1576 recognized the leadership of Henry of Navarre); (2) the Holy League, led by Henry, Duke of Guise, in close alliance with Philip ii. of Spain; (3) the Monarchists—those who adhered to the legitimate king, Henry iii. The struggle between these three parties is known as the 'war of the three Henrys.' The king was driven out of Paris in 1588, but later in the year he procured the assassination of Duke Henry of Guise and his brother the cardinal. The League now declared its hostility against the king, who was in consequence driven into an alliance with Henry of Navarre. Together they laid siege to Paris in 1589, and seemed on the point of reducing the city by famine when Henry iii. was assassinated.

Henry of Navarre was a Protestant; and the League, actively supported by Spain, resisted him vigorously. He made an alliance with Elizabeth of England, and he gained the victories of Arques (1589) and Ivry (1590). He then proceeded somewhat leisurely to the blockade of Paris; but the siege was raised by the approach of Alexander of Parma, the great Spanish general, from the Netherlands (1591). Again in the next year Henry was foiled by the same antagonist at Rouen. Now Henry, though he could defeat his enemies, could not force them into submission. It was his religion that stood in the way. 'Paris,' he thought, 'was well worth a mass,' and he determined to avow himself a Catholic. The formal change of creed took place in 1593, and before the end of 1594 he was the unrivalled king of France. With him begins the Bourbon dynasty. The war with Spain, however, was still continued, until the treaty of Vervins in 1598 brought it to a temporary cessation. The latter years of the reign were occupied with domestic policy. Sully, his great minister, improved the administration of the finances, encouraged agriculture, and assisted the king in beating down the power of the nobility. But the two most important domestic incidents of the reign were the Edict of Nantes (1598), whereby an un-

exampled measure of religious toleration was granted to the Huguenots, and the establishment of the Paulette, whereby membership in the judicial bodies called parliaments was made hereditary, on payment of a percentage of income. When he was assassinated in 1610, Henry left only a boy nine years of age to succeed him.

Louis xiii.'s reign lasted from 1610 to 1643, but it was not until the murder of the queen-mother's favorite, D'Ancre, in 1617, that he began really to rule. During nearly the whole of his reign his personal influence was overshadowed by the genius of his great minister Richelieu. The double aim of Richelieu was to centralize and unify all France under the crown, and to establish France as the dominant power in Europe. He pursued both aims with extraordinary tenacity and genius. In his foreign policy he had to fight against the allied and kindred houses of Spain and Austria. In his domestic policy Richelieu crushed the separate political existence of the Protestants by the capture of Rochelle (1627), but showed no desire to destroy the religious toleration that had been granted by the Edict of Nantes. He had continually to watch the plots of the French nobles, who were led by the king's brother, Gaston of Orleans; and though he often seemed likely to be overthrown, he was triumphant in the end. The same policy underlies Richelieu's attacks on the parliaments of Paris and other cities for the representative assemblies of the provinces, his destruction of the nobles' castles, and his establishment of provincial intendants (royal officers for the control of the provinces who are henceforth of the first importance for the general government of the country). The age of Louis xiv. was largely the result of his action.

The reign of Louis xiv. is the longest in France, and perhaps in European history (1643-1715), but it was not until 1661 that the king began really to govern. The first eighteen years of his reign saw the government of the queen-mother and her minister Mazarin. This period was, in foreign policy, a continuation of the action of Richelieu; but meantime the internal politics of France fell into confusion and civil war, from want of a strong hand and will. As a result of the action of Richelieu, France was engaged in practically two wars. In Germany, in close alliance with the Protestant powers of Europe, she was fighting against the power of Austria, while at almost every point of her frontiers she had to resist the designs (military and diplomatic) of Spain. In both wars Mazarin reaped what Richelieu

had sown. The French armies were well disciplined and admirably led by Condé and Turenne, and Mazarin was, in diplomacy, a worthy successor of Richelieu. In 1643 Condé broke the Spanish infantry in the great battle of Rocroy in the Netherlands, and in 1644 he gained the great victory of Freiburg on the Upper Rhine. Other notable events were the battle of Nördlingen in 1645 and the invasion of Bavaria by Turenne in 1646. The result was that the empire consented to make peace, and the Thirty Years' War was ended by the peace of Westphalia (1648). France gained greatly. Her claim to Metz, Toul, and Verdun was recognized, and Alsace was added to her within ill-defined limits; in Italy, Pinerolo was recognized as French.

The empire had made peace, but the war with Spain still remained, and was complicated by the outbreak of civil war. The decisive event was the alliance which Mazarin managed to negotiate with Cromwell. The Spaniards were defeated at the battle of the Dunes (1658), and accepted the peace of the Pyrenees in 1659. Spain ceded territory on the northern frontier of France; but the most important point was a contract of marriage between Louis xiv. and the Infanta of Spain, coupled with a stipulation that the French king should renounce any inheritance of Spanish territory that might come through his wife.

Mazarin died in 1661, and Louis xiv. announced his intention of acting henceforward as his own first minister, and of conducting the government himself. At home Louis xiv. was the center of the most splendid court in Europe, and the standard of manners set there reacted beneficially on all Europe. He was a generous if not a very discriminating patron of letters, and his support of Molière deserves especial mention. The early years of his reign saw a splendid and successful effort on the part of his minister Colbert to reorganize the finances and industry of the country. Colbert was a man of great knowledge and energy, and while his influence lasted France was the best administered country in Europe. The religious history of the reign was also of great importance. The king was a sincere Catholic always, and towards the end of his reign his sincerity darkened into bigotry. The results were seen in the persecution of the Huguenots. They were no longer a danger to the monarchy; their members were peaceful, industrious, active both in trade and commerce; but their independent religious position offended the personal vanity and the religious bigotry of the king. In 1685 the Edict of Nantes (Henry iv.'s

great measure of toleration) was withdrawn. The Huguenots were forced into submission or took refuge in exile. The loss thereby occasioned to France (moral, financial, and industrial) was one of the most serious blows sustained during the whole reign.

Louis xiv. was very ambitious of military glory, and his reign was full of wars: the first, concerning certain portions of the Spanish Netherlands, ceded to France by the treaty of Aix-la-Chapelle; the second and third, with Holland, which had formed the Triple Alliance with England and Sweden, a war for territorial aggrandisement ending with the peace of Ryswick in 1697, and the fourth (brought about by the death in 1700 of the Spanish king), the War of the Spanish Succession. Charles II., by his will, had left the Spanish possessions to the grandson of Louis xiv. (Philip of Anjou). The union of the French and Spanish territories seemed to unsettle entirely the European balance, and a great coalition was formed to prevent the union (England, Holland, the empire, with certain smaller powers). France struggled against the armies of the coalition, led by Marlborough and Prince Eugene, up to the battle of Blenheim (1704). But that crushing blow entirely changed the situation; and henceforth France struggled against hopeless odds, constantly asking for a peace which the allies refused to grant. It is only possible to mention the chief battles. Ramillies in 1706, Oudenarde in 1708, Malplaquet in 1709 were all defeats for the French. Only in Spain did they gain victories (Almanza 1707, Villa Viciosa 1710). Peace came unexpectedly at Utrecht in 1713, and was brought about largely by a change of ministry in England. Louis was succeeded by his great-grandson, Louis xv. His long reign saw the authority and popularity of the French monarchy entirely undermined, and laid the foundation of the destructive part of the revolution.

In 1733 Louis xv. entered upon the war of Polish Succession in support of the claims of his father-in-law, Stanislas Leczinski. France was defeated in the avowed object of the war, but by the peace of Vienna (1738) she converted her effective possession of Lorraine into a recognized and legal power. In 1740 the death of the Emperor Charles vi. brought on the war of the Austrian Succession, in which France, in alliance with Frederick of Prussia, fought against Maria Theresa of Austria and England. The French were defeated at Dettingen in 1743, and had previously been driven from Bavaria. But in 1745 they won the great battle of Fontenoy, and in 1747 the victory of

Laffeldt gave them possession of Holland and the Netherlands. But the fighting of the war took place also in many other quarters of Europe, in India, and America.

In 1748 the peace of Aix-la-Chapelle established the *status quo* of the beginning of the war. But France having abandoned the alliance of Frederick of Prussia for that of Maria Theresa of Austria, the great war came in 1756. There have been few more important wars in European history. The very existence of Prussia was at stake, and between England and France the stake fought for was the possession of India and the New World. The policy of France was weak and purposeless. The French arms were disgraced in Europe (Rossbach, 1757), and the English triumphed in India, America, and on the seas. These humiliations were confirmed by the peace of Paris (1763).

The domestic policy of the reign has many features of interest. The Parliament of Paris, so passive under Louis xiv., resisted the edicts of the king, until it was abolished in 1771. Meanwhile a series of mistresses 'in title' squandered the resources and misguided the policy of France. The intellectual movement of the time was thoroughly destructive in its tendency. Voltaire, Rousseau, Diderot, Montesquieu, D'Alembert, however much they suffered from one another, agreed in opposing the existing régime both in church and state. The people complained of poverty and unjust taxes; the philosophers attacked all existing institutions, and found no one to answer them. The nobility and clergy had both lost their former hold on the country; the monarchy, absolute in name, was in fact weak, unpopular, disorganized, and tottering to its fall.

The whole reign of Louis xvi. (1774-92) is merely a prelude to the revolution. He was humane, honest, and sincerely anxious for important reforms; but he was deficient in intellectual power, and wholly unequal to the task that was laid upon him. His wife, Marie Antoinette, with many admirable qualities, was a dangerous influence rather than an assistance. The first fifteen years of his reign are marked by the efforts of a succession of ministers, Turgot, Necker, Calonne, and de Bricisne, to improve the financial situation which had been further complicated by England's war with her American colonies, begun in 1775. Attempts at taxation were met by an increasing demand for the calling of the States-general. Their convening in May, 1789, marks the beginning of the French revolution. It may be noted that it was the product of three different impulses or wants. First, there was the urgent

need of reform in the political government of France; next, France was full of vague but strong hopes of a vast social change that should destroy poverty and crime; third, the whole of France, and to some extent of Europe, was fermenting with new hopes, new ideals which taken together amount to a profound though indefinite religious movement.

The first and mainly political phase lasted down to September, 1791. During these months changes of the vastest kind passed over France. The Assembly had three names before its course was run. First it was the States-general; then, on June 17, it took the title of the National Assembly; later it called itself the Constituent Assembly. The leading members were Lafayette, Bailly, Orleans, Mirabeau, Robespierre. It got through a prodigious amount of work, much of it of permanent effect. Feudalism was abolished. The church in France was put under the direct control of the state, and its property was confiscated. France was divided into departments, and the old provinces were abolished. A constitution was drawn up, on the basis of constitutional monarchy, with a single elective chamber resting on a broad but not universal suffrage. The work was carried out amidst much confusion, caused partly by the risings of the Paris people, partly by the resistance of the king, who, in June 1791, even fled from Paris in order not to be answerable for the work of the Assembly. But in the end he accepted that work, and consented to govern according to the terms of the constitution.

Many men thought that the revolution was at an end, but its most violent phase had not yet begun. Many causes precipitated France towards the Reign of Terror, but the most influential were the outbreak of a great war against Prussia and the empire, and the suspicion that the king sympathized with the foreign enemy. In October, 1792, the first (and last) Legislative Assembly met according to the constitution of 1790-1. The three chief parties were the Jacobins (extreme revolutionaries), the Girondists (more moderate), and the Feuillants (reactionaries). In April, 1792, war was declared against Austria, but the invasion of the Netherlands ended in failure. Prussia joined with Austria, and the invasion of France was meditated. The chief feeling in Paris was indignation against the suspected treason of the king. On August 10 the palace was stormed by an angry crowd, and the monarchy was declared suspended. The general result was the calling of a new

assembly, based on manhood suffrage, to be named the Convention.

The Convention sat from September, 1792, to 1795. During its sessions France passed through an amazing transformation. The monarchy was declared abolished, and the republic was proclaimed. Then, by the energy and success of their foreign policy, as well as by their violence at home, the Jacobins gained a complete mastery of France. Louis XVI. was guillotined in January, 1793, and Marie Antoinette in October of the same year. (See also FRENCH REVOLUTION.) The Committee of Public Safety (with Danton as the chief influence at first and afterwards Robespierre) was the chief agency of government, and Carnot undertook the general direction of the campaign. Dangers of every kind, external and internal, seemed to threaten the revolutionary government with destruction. Yet the Jacobins triumphed over all enemies. At the same time a series of remarkable domestic measures were passed. Christianity was declared abolished, and in its place was established first the worship of Reason, and then (by Robespierre) that of the Supreme Being. A new calendar and a new era (commencing in 1792) and a decimal system of weights and measures were adopted. The government was meanwhile supported by measures of the most violent kind, which, taken together, are known to history as the Reign of Terror. This system was worked by Danton, Marat, and Robespierre; but Danton was executed, Marat was assassinated, and for some time Robespierre exercised something like a dictatorship. When, in July 1794, Robespierre himself fell, the Reign of Terror came to an end, and a strong reaction set in towards constitutional government. A new constitution was drawn up, whereby the executive was to be vested in five directors, and the single legislative chamber was to be replaced by a Council of Ancients and a Council of Five Hundred. The rising of Vendémiaire, directed against the Constitution (the constitution of the year III.), was crushed by Napoleon. With this year his prominent career begins, and the history of the battles and campaigns which carried the French arms into every corner of Europe must be looked for under his name. Here the domestic history of France will alone be followed.

We will first note the successive changes in the form of government. (1.) The Directory, established in 1795, lasted until 1799, in spite of much discontent and opposition. In 1799 it was overthrown by the revolution of Brumaire (Nov. 9), which was chiefly the work of

Sieyès and Napoleon. (2.) Shortly afterwards (Dec. 24) the constitution of the year VIII. was drawn up, by which the executive was vested in three consuls, with Napoleon as first consul, and all the machinery of government was rearranged on more conservative and autocratic principles. (3.) In 1802, after the peace of Amiens, Napoleon was appointed 'First Consul for life,' and the title was ratified by the French people. (4.) In 1804 all veils were cast aside, and Napoleon became emperor of the French, and in December he was crowned at Paris by Pope Pius VII. This title Napoleon maintained until his abdication in 1814 and his exile to Elba. This title he resumed when he landed in France in 1815, and he claimed it still in his exile in St. Helena. (See NAPOLEON I.)

The restless energy and genius of Napoleon overhauled the whole machinery of administration. Commerce, agriculture, manufacture, the revenue, museums, libraries, education, public works, all received a powerful impulse at his hand. The two most definite results of his activity were: (1.) The concordat with the pope, whereby the Catholic church became once more the official church of France, but the appointment of all ecclesiastical officials was vested in the emperor. (2.) Cambacérès, the second consul, undertook a systematic digest of the laws of France, which resulted in the Code Civil or Code Napoléon, which was promulgated in March 1803. France still bears, deeply imprinted on every part of her life, the results of these two acts.

The year 1815 seemed a year of cataclysm. Louis XVIII., brother of Louis XVI. (for the boy king, Louis XVII., had died in prison), succeeded to the throne promising to govern according to the provision of a Charter of Liberties. Louis XVIII. died in 1824, and his brother Charles X. succeeded him. He was a more ardent champion of religion and political absolutism than his brother, and six years sufficed to bring the monarchy to irretrievable disaster. Paris rose; the Tuileries palace was sacked. The king, unable to resist, fled to England. But France was not yet ready to resume the experiment of the republic. The Chamber invited Louis Philippe, a relation of the exiled king, and the son of Philippe Egalité, Duke of Orleans, to become their constitutional king. He ruled until 1848.

The king was served by great ministers, of whom Casimir Périer, Thiers, Guizot, and Soult were the chief, and in many respects France made undeniable progress during his reign. Despite the king's pacific desires, France

was engaged in three wars of some importance. A war with Algiers from 1830 to 1847 resulted in the annexation of the country. Other wars were fought with Mexico (1838-9) and with Morocco (1844). But the matter of most importance during this reign was the agitation and violence of public opinion. In 1840 the body of Napoleon was brought from St. Helena and buried amid great excitement in Paris. In 1836, and again in 1840, Louis Napoleon attempted to overthrow the government, but failed somewhat ignominiously. In 1847 Guizot was prime minister, but he steadily and firmly resisted all agitation for reform. The movement, however, culminated in 1848. There was a revolutionary outbreak in Paris on February 21. Guizot resigned, and Louis Philippe abdicated the throne.

The republic was declared, but the new form of government was only established after several days of desperate street fighting. Louis Napoleon hastened over from England, and was elected president by a great majority. In December, 1851, he dissolved the Assembly by proclamation, made himself dictator, and appealed to the people to ratify what he had done: 7,500,000 voted in his favor and only 650,000 against him. In December, 1852, he was proclaimed emperor, with the title of Napoleon III. Under this title he reigned for eighteen troubled years. The reign saw a series of wars. (1.) Napoleon III. invaded Italy (1859), and fought against the Austrian power, nominally for the liberation of Italy. But after the great victories of Magenta and Solferino he accepted the peace of Villa Franca (1859) whereby Lombardy became Italian, while France took Savoy and Nice. (2.) In 1863 he entered upon an expedition against Mexico, with a view to re-establishing a great French and Catholic empire there to balance the United States. But the resistance was much greater than was anticipated; European affairs were very threatening, and in 1865 the expedition was abandoned. (3.) Yet these were but a tame prelude to 1870—the real *année terrible* of French and European history. The unscrupulous ambition of two men—Napoleon III. and Bismarck—came into collision. France entered upon the war with the most confident anticipations of success. Then there came the terrible disillusioning. The French were defeated at Weissenburg (Aug. 4, 1870), at Wörth (Aug. 6), at Spicheren (Aug. 6), at Gravelotte (Aug. 18), and, as a result of the last battle, Marshal Bazaine and a large army were cooped up in Metz. An army under Napoleon himself went to their relief, but the French were dis-

astrously defeated at Sedan (Sept. 2), and Napoleon surrendered with 83,000 men. (See FRANCO-GERMAN WAR.)

This terrible news overturned the empire. The republic was proclaimed from the Hôtel de Ville. The Germans claimed concessions of territory; these were refused them, and their army in consequence marched upon Paris. The city, under the direction of the government of National Defence, prepared itself for a heroic resistance. At last famine did its work, and in January, 1871, France had to surrender very nearly on the terms that Germany proposed. All Alsace (except Belfort) and part of Lorraine were to be surrendered, and a war indemnity of \$1,000,000,000 was to be paid. German troops were to remain in France until all was paid off. These terms were embodied in the treaty of Frankfurt (May 10).

On Feb. 13, 1871, the National Assembly, elected after the fall of Paris, met at Bordeaux, and assumed the reins of power hitherto held by the government of National Defence. Since the meeting of the States-general in 1789 no representative body had contained so many distinguished men. Disagreeing on the essential point of the choice of a sovereign, the majority decided to allow the republic, declared after Sedan, to grapple with the disastrous state of affairs. M. Thiers was elected chief of the executive power at Bordeaux on February 17, and received the title of president of the republic; and from this point the history of the third republic begins. In spite of the burdens of the war indemnity the vitality of the country seemed unimpaired. Within three years the indemnity was cleared off, France was freed from the presence of the enemy in her territories, and her shattered forces were reorganized.

As soon, however, as the German occupation ended, political unanimity disappeared, but finally, by 1879, the policy of the government became steadily republican. At the instance of M. Jules Ferry, minister of education, a decree was issued in 1880, by which members of any 'unauthorized' religious orders exercising the profession of teaching in any school in France, and all religious orders which would not submit to certain conditions necessary to gain the state sanction, were dissolved. This enactment was aimed chiefly at the Jesuits. In 1884 the constitution and the senatorial electoral system were revised and put upon their present basis. The following year members of the royal houses which had formerly

ruled France were declared ineligible for military or civil office.

In 1881 France entered upon an active colonial policy by undertaking a military expedition to Tunis, and establishing a protectorate over that country. During the next few years she reduced Madagascar to the rank of a French possession. The advance of France in Indo-China led to war with China in 1883-5, which resulted in the establishment of a French protectorate over Annam and Tong-king. In 1887 M. Sadi-Carnot was elected, during whose administration the Panama Canal scandal occurred, involving many prominent men and weakening the government. (See PANAMA CANAL.)

In 1894 President Carnot was assassinated at Lyons by an Italian anarchist, and was succeeded by M. Casimir-Périer, who resigned in 1895, and was followed by M. Félix Faure. The most notable events of these years were the Franco-Russian *entente* and the Dreyfus case. Upon the death of President Faure, in 1899, Emile Loubet was elected president. An important agreement was signed on April 8, 1904, consisting of a convention with regard to Newfoundland and West Africa, a declaration dealing with Egypt and Morocco, and another relating to Siam, Madagascar, and the New Hebrides. The visit of the British fleet to Brest in 1905, and the return visit of the French fleet to British waters, together with the signing of a new Anglo-French treaty, emphasized the *entente cordiale* between the two countries. President Loubet was succeeded in 1906 by Clément Armand Fallières.

The strained relations between the government and the Catholic Church had culminated in 1905 with the passage of an act abrogating the Concordat. The state took over the control of church properties and schools, and a supplementary act of 1907 placed the Roman Church on the same footing as Protestant and Jewish congregations.

In August, 1908, an attempted general strike of all laborers failed. In March, 1909, a strike of post-office and telegraph employees caused great inconvenience until settled by compromise. This was followed in October, 1910, by a railway strike which threatened to become general, but which was checked by the prompt action of Premier Briand, who, taking advantage of the act providing for universal military service, called the strikers to the colors and ordered them to operate the roads.

During the period from 1905 to 1912 relations with Germany were severely strained over the Moroccan situation. (See MOROCCO.)

In 1907 the Casablanca incident, caused by the sheltering of French deserters by the German consul at that Moroccan town, threatened the relations between the two countries until settled by arbitration at The Hague. A third crisis occurred in 1911. In May of that year a French force was despatched to Fez to quell a revolt of certain of the southern Berber tribes. The force was not immediately withdrawn, and Germany, claiming a breach of the Algeiras convention, despatched the German warship *Panther* to Agadir, while German troops were landed in the town. At this juncture Great Britain intervened, and diplomatic interchanges followed, issuing in the treaty of Nov. 4, 1911, by which Germany again acknowledged the French protectorate, receiving in return equality in trade and part of the French Congo, for which France received part of the German Kamerun. Treaties with Spain and Morocco were signed in 1912.

In the period from 1910 to the outbreak of the Great War in 1914 a number of disasters marked the history of France. In January and February, 1910, the most serious floods ever recorded occurred in the Seine district. At Paris the river overflowed a considerable portion of its banks and caused enormous destruction of property (see PARIS). The failure of the wine crop in 1910 entailed a loss of \$1,000,000. Of public enterprises two stand out boldly, the electrification of St. Lazarre Station and the Paris belt line (1911), and the beginning of the great tunnels designed to connect France with Italy and Central Europe.

With the fateful year of 1914 France was plunged into war with the Central Powers (see EUROPE, GREAT WAR OF) by virtue of her defensive alliance with Russia, whereby each was pledged to go to the other's defence in case of attack. Germany's declaration of war against Russia, Aug. 1, 1914, and mobilization on the Russian frontier called forth France's declaration against Germany Aug. 3. This was followed by England's declaration, Aug. 5, bringing France, England, and Russia into alliance. The Germans swept the French and Allied troops toward Paris, reaching the Marne in September, the limit of the German invasion, and causing the removal of the French government from Paris to Bordeaux (Sept. 3, 1914), where it remained until Dec. 11, 1914.

Frequent cabinet changes marked the war period. Ministry followed ministry, each striving to organize the country and the government for the better prosecution of the war, but the successful German drives, the unfortunate attempts at Gallipoli, and the apparent

vacillating course with Greece, weakened the people's confidence. Premier after premier resigned, eight in all holding office from June 1, 1914, to Nov. 15, 1917, when Dr. Georges Clemenceau was elected.

The year 1918 saw the clearing of the Germans from Northern France, the complete collapse of the Central Powers, and the signing of the Armistice, Nov. 11, 1918. The effects of the war in France were appalling. The population decreased over three-quarters of a million, exclusive of deaths in Northern France and others directly due to the war; 7,000,000 acres of land were found to have been rendered uncultivable, 250,000 buildings were destroyed during the conflict—among them the Cathedrals of Rheims, Arras, Soissons, Albert, and Peronne; while the important towns of Ham, Noyon, Nesle, Roye, Soissons, Fismes, Ypres, and Rheims were desolated. The indebtedness, including loans from England and America reached the enormous total of \$155,600,000,000. To meet this great burden a lottery bill was introduced July 4, 1919. For measures to alleviate the conditions caused by the War, see RECONSTRUCTION.

The rapid growth of the Socialist Party has been one of the outstanding features of French history of the past few decades, the Socialist vote growing from 30,000 in 1885 to 1,106,000 in 1910, and 1,400,000 in 1915. This growth was paralleled by a changing attitude toward the government as the balance of power swung from the conservative to the radical element. Prior to the war (1914) and during the first years of it the Socialist Party stood solidly behind the government, but gradually the radical element gained ascendancy, until in 1918 it held the balance of power. It attacked the renewal of the charter to the Bank of France; the concentration of authority for the more vigorous conduct of the war; the change from the two-year term of military service to the three-year, designed to meet the large increase in the German army, and harassed the government with demands for a revision of the aims of the war.

Beginning with 1910 and continuing through the war an epidemic of scandals scourged France, the most famous of which was the notorious Caillaux case, which antedated the outbreak of the war, culminating in March, 1914, in the murder of Gaston Calmette, editor of the *Figaro*, by Mme. Caillaux, who had been rendered desperate by Calmette's journalistic attacks upon her husband. The attacks were based upon Caillaux' official misconduct as Premier and upon his secret intercourse

with Germany during the Moroccan crisis. Mme. Caillaux was brought to trial but was acquitted and her husband resigned from the Cabinet in which he was Minister of Finance. Subsequently he was arrested (Jan. 15, 1918) for traitorous communication with the enemy during the Great War (1914-18), and was brought to trial on a charge of high treason.

Just before the signing of the Peace Treaty, the United States, England, and France entered into a treaty binding the first two to assist France in case of an unprovoked attack by Germany. The public celebration of the signing of the Peace Treaty was held on the 130th anniversary of the fall of the Bastille, July 14, 1919.

After the signing of the Versailles Treaty difficulties of all sorts began. During the hostilities and the Peace Conference domestic questions had naturally remained in abeyance, but now the old party controversies again broke out. A general election was held on November 16, 1919: it proved to be a victory for the moderate groups, and the election of M. Deschanel as President of the Republic (Jan. 17, 1920) marked the liberal tendencies of the new Chamber.

But the chief difficulties were those relating to the financial entanglements of the country. After the enormous expenses incurred during the war the treasury was empty and the national debt amounted to no less a sum than 30 billion dollars. The ordinary budget presented a deficit of two billion francs and it was foreseen that the extraordinary expenditure for the reconstruction would exceed seven billions more. It became evident that if Germany did not pay her war debt and did not help in the reconstruction France could never recover. The years 1921 to 1924 were marked by constant, mostly futile, efforts to obtain these payments from Germany and to secure co-operation of the Allies towards that end.

With the end of the year 1922 it became clear that Germany was resolved upon evading her obligations in the matter of reparations. The public, as well as the Government, became alarmed, for it was impossible to see how reconstruction could be carried on, and the debt to England and to the United States be paid if no indemnity was received from Germany. After another conference on reparations, held in Paris, had proved fruitless, M. Poincaré, responding to the popular feeling, announced his intention of seizing some gage which he would keep until Germany fulfilled her obligations. Consequently French and Belgian troops occupied the Ruhr district (Jan. 10

1923), and measures were taken to exploit that industrial section of Germany in the name of the Allies. As a result, in May 1923, Germany which had organized 'passive resistance' in the Ruhr began to approach the Allies with certain offers and after some months' negotiations the German government promised that 'passive resistance' would cease.

This was a great success for M. Poincaré; but Germany's refusal to contribute to the reparations had rendered the financial situation still more desperate. The work of reconstruction had necessarily been pursued in the meantime, and enormous sums, which brought the total deficit up to 17 billions had been spent, while all the time the fall of the franc, accelerated by the manoeuvres of international speculators, had continued, until the dollar was worth about thirty francs.

Meanwhile the relations with England had been of the coldest, but at the beginning of 1924 the Baldwin Government was defeated, and the Labour Government that succeeded worked on more friendly terms with the moderate French Government than the English Conservatives had done, a fact which, no doubt, did much to facilitate the work of the Dawes Committee, whose purpose it was to fix the reparation payments and also to help to stabilize the German currency. (See REPARATIONS.)

In the early months of 1924 the attention of the French began to be somewhat diverted from the financial problems towards political controversies, a controversy between various *Blocs* which led to the choice of M. Herriot, leader of the Radical-Socialist party, to form a ministry. M. Herriot arranged a meeting with Ramsay MacDonald at Chequers, and as a result M. Herriot, on July 16, at a Conference held in London, signed an accord which provisionally settled the vexed question of reparations by approving of the Dawes Plan. Germany in her turn accepted the arrangement and it was decided that the Ruhr occupation would be rendered 'invisible,' and that the evacuation would be completed at the latest in September 1925.

Financial affairs continued to be unsatisfactory and rumors of a capital levy began to alarm the French and their emotion augmented when they learned that secret inflation had been resorted to. M. Herriot resigned, the fall of the Cabinet set an end to the policy of the 'Left Bloc,' and when M. Painlevé, the leader of the Republican-Socialist party, was called upon to form a new ministry (April, 1925) he announced that a policy of appeasement was

indispensable. The Painlevé cabinet was called on to meet difficulties in Morocco and Syria, which were no sooner settled than M. Caillaux, the Finance Minister was forced to ask for further inflation up to the sum of six billion francs and for an internal loan which did not prove successful. He then turned to the question of the foreign debts. In August, 1925, he signed with Mr. Churchill a provisional agreement which was to become final if the United States consented to a similar arrangement. Whereupon M. Caillaux sailed for America, but finding that the United States Government was not prepared to accept the sums offered he was obliged to leave without anything being settled.

This failure made M. Caillaux's position difficult, and matters became worse when the Radical Congress at Nice decided to insist upon a capital levy. M. Caillaux, though he belonged to the Radical party, was, as a financier, opposed to such a measure, and M. Painlevé felt bound to dismiss his Finance Minister. He assumed the rôle of Finance Minister, and set about preparing a plan to save the nation from disaster. The most important feature of that plan was the creation of a sinking fund to redeem short-term bonds and which was to be maintained by heavy taxation upon income, in reality, a disguised levy upon capital. This project was defeated and the Ministry resigned (Nov. 22, 1925).

M. Briand undertook the difficult task of forming a new cabinet. Several ministers under him tried without avail to find a solution to the financial problem. The deputies could not agree upon any of the means proposed to balance the budget. On the 6th of March, 1926, the Cabinet was defeated on a question of taxes and M. Briand was compelled to resign. Just a few days before he had, however, been able to make the Chamber ratify the Locarno agreement, according to which Germany promised to respect the terms of the Versailles treaty in regard to her frontiers with Belgium and France, but refused to renounce a revision of her eastern frontier. In return France consented to the evacuation of the zone of Cologne which had been postponed for a year, when it was found that the disarmament clause of the Versailles treaty had not been fulfilled. In addition Germany was to have a seat in the Council of the League of Nations.

On March 10, M. Briand formed a new cabinet, this time with M. Péréte as Finance Minister, upon whom fell the responsibility of accepting the agreement with the United States in regard to the French debt, signed by

M. Beranger, ambassador to Washington, on April 29, 1926. But this agreement was found unacceptable by the French Chamber, since it did not contain any safeguarding clause in case the German payments should cease.

As those discussions were going on the fall of the franc had continued. In June it dropped to nearly 36 to the dollar, when M. Péret, finding himself unable to tackle the task, retired, his retirement involving the resignation of the whole cabinet. This time, M. Briand tried a cabinet of the Left with M. Caillaux again as Finance Minister. M. Caillaux asked Parliament for dictatorial powers enabling him to solve all the financial problems without being impeded by lengthy debates. This was taken by the deputies as an attempt at dictatorship and M. Caillaux's demand was violently resisted. The Government once more was defeated and there followed a moment of tragic suspense. The franc fell lower and lower.

M. Poincaré appeared as the only man who was capable of saving the country and at the request of M. Doumergue he formed a cabinet on July 23, 1926. He succeeded in uniting in the same ministry of National Union all the men who had played a conspicuous part in French politics all through these years of struggle, some of whom belonged to the most opposed parties. M. Poincaré immediately introduced a finance bill and asked to be allowed to take economical measures and to augment or create taxes by simple decree. The Chamber agreed to whatever M. Poincaré demanded, and the Premier, who was his own Finance Minister, could begin that series of administrative reforms that was to be the prelude of the restoration of French finances. The franc began at once to improve until towards the end of the year it settled on the level of 25 to the dollar, and in June, 1928, it was stabilized at 25.52, the stabilization bill being passed by a large majority.

While M. Poincaré was improving French finances, M. Briand, as Minister of Foreign Affairs, was attempting to bring about a rapprochement with Germany. In September, France sanctioned the admission of Germany to the League of Nations. In August, 1927, a Franco-German commercial treaty was signed. By a series of cumulative measures M. Poincaré succeeded in diminishing the floating debt and the advances of the Banque de France to the State, so that France was soon able to begin the payments of the English debt. The recovery was so miraculous that all party strife perforce ceased and in May, 1928, when

a general election took place, a strong majority of deputies favorable to M. Poincaré's policy was returned.

The newly-elected French Parliament met on June 1, 1928, and on the 7th M. Poincaré announced his program. Legal stabilization of the franc and a return to the gold standard were adopted by overwhelming majorities on June 24. The franc had a value of 19.3 cents American before the World War; in 1928 it was fixed at 3.92. Currency reform included issue of new 100-franc gold coins and 5, 10 and 20 franc silver coins to replace paper bills of the same denominations, which it was decided to withdraw from circulation by 1932. In August the Briand-Kellogg Treaty to outlaw war was signed at Paris. See PEACE PACT OF PARIS.

In July, 1929, the Chamber passed the Government measure for the payments of war debts to the United States and Great Britain. Though no reservations were attached, the accompanying debates clearly indicated the existence of a mental reservation that French payments to the two former allies would depend upon the size and regularity of German Reparations received by France. Having attained this outstanding object of his policies—that France should honor her obligations—M. Poincaré resigned July 27, 1929, on account of his health, broken by many years of uninterrupted labor.

At the invitation of President Doumergue, Foreign Minister Aristide Briand accepted the premiership—for the eleventh time in twenty years. He was under no delusion that his position was strong; he asked for a three months' truce in domestic politics in order to devote the Government's attention to pressing foreign problems. Briand received a vote of confidence on July 31, by 324 votes to 115. A conference at The Hague had been called for August to bring about the final liquidation of the financial results of the war—to consider the Young Plan of February-May, 1929. Difficulties were encountered in the ensuing discussions, particularly in the British demands, which seemed for a time to threaten the friendly relations between Great Britain and France. When a compromise was finally arrived at, Briand had lost backing at home. M. Tardieu, however, whose administration succeeded his, promptly appointed Briand his foreign minister.

The Naval Disarmament Conference opened at London in January, 1930, where Tardieu and Briand attended as the representatives of France. See NAVAL DISARMAMENT CONFERENCE. Among the five greatest naval Powers assembled, agreements arrived at were limited

to only three—United States, Great Britain and Japan; between the other two, France and Italy, the Conference revived an unfortunate controversy which lasted for several years afterward without any settlement. While Premier Tardieu was pleading the cause of France in London, his Government at home was overthrown February 17, by a hostile vote in the Chamber. M. Camille Chautemps, leader of the Socialist-Radicals, took his place.

Under the many political parties which flourish in France, the life of a government is invariably a precarious tenure. Within three days Chautemps had formed his new ministry; on the fourth day it faced the Chamber for the first time, was bitterly attacked by the opposition, and also went down in defeat. This was the 19th government France had had since the World War, making the average life of each about seven months. Tardieu was recalled to the helm, resuming office with a slightly modified list of Cabinet members, among whom Briand figured again as Foreign Minister (March 2).

In July the French Social Insurance Act came into force, a measure which would affect from eight to nine million working people and their families, applying to both men and women between 16 and 60. When they can no longer work, they will be entitled to a small allowance. There are included in the scheme a comprehensive system of sick benefits and medical care for mothers until six months after childbirth, while all participants are insured at death, the amount being paid to widows or heirs, while there is also a small provision for unemployment.

When the Parliamentary session reopened in the late Autumn, a series of financial scandals disquieted public opinion and led to condemnation of Tardieu's policy (December 4) in the Senate; a vote of 'no confidence' was carried by a majority of three and Tardieu was out with his Cabinet. Another was formed after a nine days' interregnum by M. Steeg.

The new Ministry narrowly escaped defeat in its first encounter with the Chamber, and Parliament was prorogued.

The period from Jan. 1, 1931, to the end of August, 1933, witnessed profound changes in both the domestic condition and foreign relations of France. The developments of fundamental significance were: (1) The extension of the world economic depression to France, the last of the great industrial nations to suffer its rigors; (2) the triumph of the Left in the French parliamentary elections of 1932; (3) repeated clashes between the French and United

States Governments on questions of both foreign and domestic policy; and (4) the triumph of the Hitler movement in Germany.

The effects of the world economic depression were not seriously felt in France until 1931. Thereafter all indices of economic activity and business prosperity showed abrupt declines. Unemployment had increased by the end of 1932 to approximately 1,000,000, with several million other workers employed only part time. Revenue from the tourist industry, another mainstay of French economy, declined from about 8,000,000,000 francs in 1929 to approximately half that figure in 1932. Taxation was further increased to offset these declines, causing widespread protests among practically all French classes.

Hardships imposed by the world depression and political and economic developments elsewhere in Europe and the United States were the main factors affecting French politics during the period. For France and for all Europe this was a momentous period, marked by repeated crises. Among the problems faced were the Austro-German Customs Union project, the European financial crisis, the Hoover Moratorium, the Hoover-Laval conversations in Washington, and the forced resignation of the Brüning Government in Germany, presaging the collapse of the German Republic.

France helped to precipitate the financial crisis of 1931 by withdrawing her short-term credits from Germany and Austria. Impregnable behind a huge gold reserve, which increased from 53.6 billion francs on Dec. 26, 1930, to 82.9 billion on Nov. 3, 1932, the Laval Government withstood the financial storm as it swept from Austria to Germany and on to Great Britain, the Scandinavian countries, Central Europe, and finally the United States.

The French were angered by President Hoover's failure to consult them before making his proposal of June 20, 1931, for a year's moratorium on all intergovernmental debt payments. They withheld consent to the moratorium until changes had been incorporated safeguarding the Young Plan (July 6). Meanwhile the delay nullified much of the psychological effect of the Hoover proposal in checking the economic collapse of Germany.

During Oct. 22-27, 1931, Premier Laval visited the United States to confer with President Hoover regarding reparations, war debts, disarmament, and the economic rehabilitation of Europe. He reached an understanding with Mr. Hoover on the following points: (1) Maintenance of the gold standard in France and the United States; (2) that the initiative in

any further proposals regarding reparations and intergovernmental debts should be taken at an early date by the European powers principally concerned within the limits of the Young Plan and the Versailles Treaty; and (3) that the 1932 Disarmament Conference should concern itself with 'the organization of firm foundations of permanent peace.'

Upon the resignation of Aristide Briand as Foreign Minister and the death of Minister of War Maginot, the Laval Ministry resigned Jan. 7, 1932. André Tardieu was now called upon and on February 23, formed his third Ministry from the Right and Center. Tardieu's program failed to satisfy the demand for more constructive policies or to calm French fears over the growth of Hitlerism in Germany, the steady economic deterioration of Europe, and the mounting budget deficit. In the elections to the Chamber of Deputies held May 1 and 8, the Left parties won a decisive victory. They captured 376 seats, against 146 for the Center and 74 for the Right. In the midst of the campaign (May 6, 1932) President Paul Doumer was shot and fatally wounded by Paul Groulouff, a demented Russian. Both Houses of parliament met in joint session at Versailles May 10 and elected Albert Lebrun, president of the Senate, as M. Doumer's successor.

Repudiated at the polls, M. Tardieu resigned on May 10, 1932. He was succeeded by the Radical Socialist leader, Edouard Herriot, who formed a strong Ministry of the Left on June 4, with members of his own party filling 13 of the 18 posts. M. Herriot vigorously attacked the many difficult problems confronting him. At the Lausanne Reparations Conference (June 16-July 8, 1932) he agreed to the practical cancellation of Germany's reparation obligations, on condition that the agreement would not be ratified until France had secured a reduction in her war debt to the United States. See REPARATIONS; WAR DEBTS. He reestablished the entente with Great Britain through the Anglo-French accord signed at Lausanne. With regard to disarmament, he presented a new French plan to the Disarmament Conference Bureau (Nov. 3, 1932). It called for the extension of the Locarno pacts and for definite aid to a country attacked in violation of the League Covenant and the Kellogg-Briand Pact. Later, at Geneva (Dec. 11), he signed a declaration admitting Germany's right to arms equality 'in a system which would provide security for all nations.'

Herriot's other moves in the foreign field were equally bold departures from previous French policies. He secured the ratification

of the Franco-Soviet non-aggression pact, inaugurating a period of greatly improved relations between these two previously hostile powers. He ended Tardieu's tacit support of Japanese aggression in Manchuria and joined with the League powers and with the United States in refusing to recognize Manchukuo. His support of the Kellogg-Briand Pact in Manchuria and of the Hoover disarmament proposals at Geneva led to better relations with the United States. But the ground thus gained was lost by the revival of the war-debt controversy toward the end of 1932.

Herriot sought to round out his conciliatory and forward-looking foreign policy by making the highly controversial war-debt payment of \$19,261,432 due the United States Government on Dec. 15, 1932, subject to the understanding that France would pay nothing further until a general settlement of the war-debt issue was reached. The Chamber of Deputies, by rejecting his proposal, 402 to 187, on December 14, forced Herriot to resign.

The Radical-Socialist leader declined President Lebrun's invitation to form a new Cabinet. The task was finally delegated to Senator Joseph Paul-Boncour, who on Dec. 18, 1932, formed another Ministry of the Left. It lasted only until Jan. 28, 1933, when its budget proposals were overwhelmingly rejected. Another Leftist Ministry, formed February 2 by Edouard Daladier, seemed destined for an equally short life, due to the critical aspect of the budget situation. It was June 1 before the budget for the calendar year 1933 was finally adopted. In the meantime, Premier Daladier, by his tact and patience in a trying situation, had firmly entrenched his Ministry in power and appeared to have supplanted Herriot as the strongest political figure in France.

At the invitation of President Roosevelt, M. Herriot visited Washington April 23-28, representing the French Government, and discussed with the President mutual Franco-American problems. At the World Economic Conference, which opened June 12, at London, France led a bloc of nations still on the gold standard. They successfully opposed the consideration of tariffs and other items on the agenda, demanding that the United States, Great Britain and other non-gold countries must first agree to end fluctuations in the exchange value of their currencies and return to the gold standard. When the Conference adjourned indefinitely in July, a permanent organization of the gold countries was formed

under French leadership to preserve the gold standard.

Meanwhile the excesses of the Hitler Government in Germany had alienated the friends and sympathizers which Germany had gained during the previous decade and relieved French fears of being isolated diplomatically.

Daladier seemed for a time to be succeeding in his efforts to hold his more conservative followers by a list of economies while he tried to conciliate the Left by radical measures to increase revenues. But when he proposed to reduce the salaries of all government employees, his ministry was defeated (October 24). A new ministry under Albert Sarraut attempted a similar measure and was overthrown within a month.

A new cabinet, formed on November 27, 1933, under the leadership of Camille Chautemps, was made up almost wholly of Radical Socialists. Although Chautemps met the same opposition to government pay cuts which had wrecked the ministries of his two predecessors, he finally succeeded in gaining, on December 24, support for his balanced budget. France had had her fifth Premier within the year, and the Chautemps leadership was to be brief.

In January, 1934, came the first public knowledge of the Stavisky affair, which was to shake the French political system from its foundations and to threaten the very life of the republican form of government. With its advent came the fall, January 27, of the Chautemps cabinet. On January 30 Daladier formed a new ministry, which was threatened at the outset by public disapproval. While he was receiving on February 6 the vote of confidence of the Chamber, rioting was going on in the streets of Paris outside.

On February 7, in the midst of wild disorders led by Royalists and Communists but involving all parties, Daladier resigned. In this national crisis President Lebrun appealed to Gaston Doumergue, former president, to come out of retirement and save the day. He organized a 'National Union' cabinet which included six former Premiers. On February 22 the Chamber voted, 469 to 123, blanket power to Premier Doumergue. He held office until Nov. 8, 1934. He was succeeded by Pierre Etienne Flandin.

The Stavisky scandal, which assumed overnight such critical proportions, came to light as a result of the failure of the Bayonne municipal pawnshops to pay their bonds. It was found that Bayonne had unsecured bonds for at least 200,000,000 francs. A magistrate

issued a warrant for the arrest of Alexandre Stavisky, a Polish Jew but also a French citizen. While the search for him went on, one public official after another was found to be involved until the scandal reached high into government circles.

Hitler had become in January, 1933, Chancellor of Germany, an event which changed the political aspect of Germany's relation not only to France but to other European powers. France and Great Britain united with Italy in support of Austria, endeavoring to sustain Chancellor Dollfuss in his efforts to maintain Austrian independence against the Nazi advance in 1933-1934. Negotiations concerning the Four-Power pact, proposed by Mussolini and supported by Prime Minister MacDonald of Great Britain, were abruptly terminated by the withdrawal of Germany on October 14, 1933, from the Disarmament Conference and the League of Nations.

Following Flandin, who held office from November 9, 1934, to May 31, 1935, the Premiers were Fernand Bouisson, June 1 to 4, 1934; Pierre Laval, June 7, 1935; Albert Sarraut, January 24, 1936; and Leon Blum, Socialist, June 4, 1936.

After the election of Leon Blum there was an outbreak of strikes that spread all over France; and from the fact that the workers remained in the factories, refusing to work or permit employers to enter, they were called 'sit-down' strikes.

New laws enacted during the Blum regime, or Popular Front government, as it was known, included provisions for the forty-hour week, collective bargaining between employers and trade unions, paid vacations, nationalization of the manufacture of armaments, and many others.

Camille Chautemps succeeded Blum in June 1937 in continuation of the socialistic Popular Front, and Blum returned to head it in March 1938. But on April 10, Eduard Daladier became Premier, with a more conservative government. Progress had lost pace under the Popular Front. Industry was on short hours and disrupted by strikes, and financial conditions grew worse.

Meanwhile the Rome-Berlin axis was gaining strength. In March 1938 Germany seized Austria, and French prestige was at its lowest ebb since the World War when Daladier assumed the reins. With France behind in the race of war preparation, Daladier attended the Munich conference in September 1938 and went along with Britain in the en-

deavor to appease Hitler and Mussolini; but upon his return home and being temporarily empowered by Parliament to govern by decree, he suspended the forty-hour week law and other socialistic obstructions, and put France to work.

France and Britain found it prudent: to look on while Italy and Germany dominated the Spanish civil war which ended March 1939 with victory for the Franco rebels; to permit Germany to complete its seizure of Czechoslovakia and take Memel from Lithuania in March 1939; and to allow Italy to grab Albania in April 1939. But later in 1939, the national spirit greatly revived.

On Sept. 3, 1939, Fr., simultaneously with Eng., declared war on Ger. The French army, generally conceded to be the finest in the world, was immediately mobilized and massed on the Maginot Line along the Fr.-Ger. border. All divisions of French life were quickly transformed to a war basis, Premier Daladier being given the right to rule by decree for the duration of hostilities. Ger. captured Paris only 35 days after opening her assault on the Low Countries, May 10. On June 17 France sought an Armistice, Marshal Pétain having become Premier the preceding day. Under the terms of the Armistice the Nazis occupied the entire Atlantic seacoast, as well as Paris and the northern provinces. Under Pétain the government became totalitarian. In 1941 England occupied Syria and Japan took Indo-China. June 23, 1940, under Gen. Charles de Gaulle, a Provisional French National Committee was set up in London (called the Free French, later the Fighting French). The U. S. recognized Pétain's Vichy government, however, and, when the French in N. Africa joined the Allies, favored Admiral Darlan, a former Vichyite, as the leader of the French forces. On Darlan's assassination, Gen. Giraud took his place, and in August, 1943, de Gaulle and Giraud headed the French National Committee of Liberation. In November Gen. Giraud resigned, although he remained as Commander-in-Chief of the French forces. In June 1944 the name of the Committee was changed to the Provisional Government of the French Republic. The U. S. gave it a limited recognition and reopened trade. In 1945 Laval surrendered and returned to France as a witness at the trial of Marshal Pétain. Pétain was found guilty but his sentence of death was commuted to life imprisonment by de Gaulle, Provisional President.

France: Language and Literature. It

is customary to begin an account of French literature with the so-called epic period. French epic poetry may be divided into three cycles. The title *chansons de geste* properly belongs to the first series of epic poems, which are largely concerned with the wars of Charles Martel and his grandson Charlemagne. The *chansons de geste*, as we know them, were the work of the trouvères of the 11th and 12th centuries. They are written in decasyllabic verse, and assonance is used. Two kinds of *chansons de geste* are to be noted—those which deal with the sentiment of loyalty to the king, and those which are inspired by feudalism. To the first class belongs the *Chanson de Roland*, dating from the second half of the 11th century.

The Breton poems are quite different from the French ones. Even in the middle ages they received the name of *fiction* as opposed to the quasi-historical *chansons de geste*. The Celtic legends cluster round the name of Arthur. It was not till 1170 that they were put into French metrical form by Chrestien de Troyes. The third form of epic poetry was written by ecclesiastics, and is pseudo-classical in theme. The most famous of those poems is the *Roman d'Alexandre*, by Lambert le Tors and Alexandre de Bernay.

From the epic period we pass to the lyric. It is usually thought that French lyric poetry came from the troubadours of the south, but this is not so. It was not till the middle of the 12th century that the Provençal influence made itself felt.

Another form of literature much in vogue during the middle ages was *les fabliaux*. The larger proportion of these came from the East, but some are of pure French origin. In one of them, *Le Vilain Mire*, we find the original of Molière's *Médecin Malgré Lui*. The Palais Royal farce is the lineal descendant of the *fabliau*. Besides *fabliaux* there were satires written in various forms. The most famous writer of satire was Rutebœuf (fl. 1255-80). During the middle ages all fables were supposed to come from Æsop, and a collection of them was called an *ysopet*. The most famous was the *Roman du Renart*.

Didactic poetry finds a representative in Guillaume de Lorris (fl. 1236). He wrote the first part of the celebrated *Roman de la Rose*, the second part of which was written forty years afterwards by Jean de Meung.

History proper does not begin till the appearance of Villehardouin's *Conquete de Constantinople* (1207). This work has value, written as it was by a great noble who had taken

a prominent part in the fourth crusade. Next in order we have Joinville's *Histoire de St. Louis*, written in 1309 at the solicitation of Jeanne de Navarre, wife of Philippe le Bel. The chief merit of his book is in its perfect simplicity. After Joinville we come to Froissart's *Chroniques*, which possess something of the charm of Herodotus in their variety, color, and abundance. The period which he treats extends from 1326 to 1400. After Froissart we have Philippe de Commines (c. 1445-1511). With him begins political history, and to him we owe the picture of the crafty Louis XI. The prettiest novel of the middle ages is *Aucassin et Nicolette*, written in the 13th century.

We now pass to the drama. Originally the church was the theater, but by the 12th century the action of the religious play spread into the street. The 13th century has left us two miracle plays—*Le Jeu de St. Nicolas*, by Jean Bodel of Arras, and *Le Miracle de Théophile*, by Ruteboef. The 14th century gives us the miracle plays of *Noire Dame*; but it is not till the 15th century that the drama finds its full expression in what are called *mystères*, or rather *mistères*. The *mistères* continued to be acted till 1548.

The most ancient French comedy is called *Le Jeu de la Feuillée*, and was written by Adam de la Halle, the hunchback of Arras, about the year 1260. Little is known about the origins of French comedy. The most famous farce of the 15th century is that of *L'Avocat Pathelin*, the authorship of which is disputed. The greatest lyrical poet of the 15th century in France was, without doubt, François Villon (1431-89?). His *Grand Testament* contains some of the loveliest poetry ever written. We all know his *Ballade des Dames du Temps Jadis* from the admirable translation made of it by Rossetti. With the 16th century we reach the renaissance and the reform, and the first great name in French literature we meet with is that of Clément Marot (1497-1544). His best work is to be found in his *Épîtres*, which are full of wit and charm.

In 1549 appeared a remarkable manifesto called *Defence et Illustration de la Langue Française*. Its author, Joachim De Bellay, was one of that constellation known as *La Pléiade*, whose brightest star was Ronsard. Ronsard (1524-85) published his first volume of verse in 1550. He is a considerable poet, and did much for French versification. His contemporary, Du Bellay, was also a good poet. His best poem is *Les Regrets*—a poem written in Rome. Du Bartas (1544-90), a Protestant, and a disciple of Ronsard, wrote

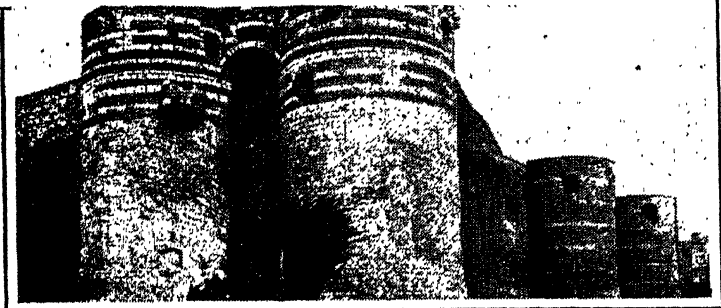
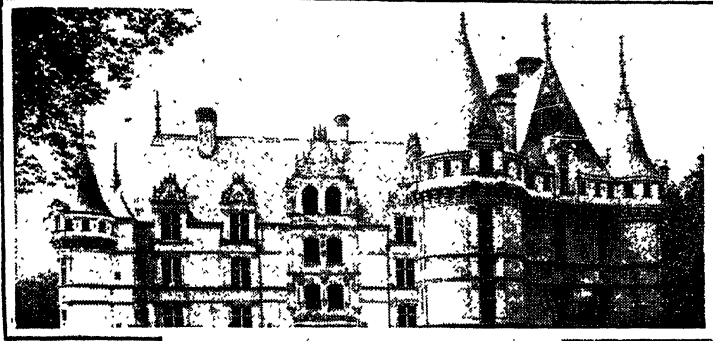
a poem called *La Semaine*. The 16th century took a new departure in drama. Jodelle wrote his *Cléopâtre* (1552). This play is the first French tragedy in the specific sense of the term. It was Garnier (1545-1601), however, in his *Les Juives*, who founded the 'classical' style.

Bulking hugely among the writers of the 16th century stands Rabelais (1495-1553). Gargantua, Pantagruel, Panurge, Picrochole, Triboulet, La dive Bouteille, L'Abbaye de Thélème, are words to conjure with for some people whose love of ideas is stronger than their literary judgment. Rabelais sums up in his personality and writings the spirit of the renaissance struggling to free itself from the discipline of the church. The best qualities of his style are its *verve* and richness.

Another remarkable name of that epoch is Margaret of Angoulême, queen of Navarre, sister of François I. Her *Heptaméron* is an avowed imitation of the *Decameron* of Boccaccio. Another great book of the 16th century is the *Institution Chrétienne* of Calvin (1509-64). Its interest lies in this, that it brought theological discussion out of the schools and made it accessible to the 'man in the street.'

The greatest prose writer of the 16th century in France is, without doubt, Montaigne (1533-92). His essays are a mine of useful and useless information—always charming and interesting. He is one of the most readable of writers, and one of the most read. His scepticism is universal and complete, his motto being 'Que sais-je?'

The 17th century is usually called the great century of French literature, and in some ways, no doubt, it merits the name. In it literature all round reached a high level of excellence, except in the case of lyric poetry. Malherbe (1555-1628), in spite of his pretensions, is not a lyric poet to be placed alongside Ronsard, although he ranks high as a reformer of language. His aim was to clear poets from the influence of Spain and Italy, and also from the affectations of the imitators of Ronsard. In this he succeeded but too well, and for two centuries French poetry remained bound in his chains, till it was released by Victor Hugo. As Malherbe was the reformer of French verse, so Balzac (1597-1654) was the reformer of French prose. One cannot pass the 17th century without making mention of the famous *salons*, first among which comes L'Hotel de Rambouillet (1620-48), founded by the marchioness of that name. The influence of these *salons* was very great. Men of letters there met men of rank and ladies of high birth and



France: Some Famous Chateaux.

Upper, Azay-Le-Rideau; Middle Right, Chaumont; Middle Left, De La Bretesche;

breeding. The result was that the standard of literary taste was raised, and indecency and coarseness had to veil themselves.

The three great names in the dramatic literature of the 17th century are Corneille, Racine, and Molière, and of these the most interesting and important is Molière. He stands unrivalled in his own domain, that of satirical comedy. At the beginning of the century the theater was not a fully popular institution, but was confined to a select circle. With Alexandre Hardy (1560-1631) it became an amusement for all classes.

Corneille (1606-84) produced his first play (*Mélite*, a comedy) in Paris (1629). He produced the *Cid* (1636), which took Paris by storm. Never in the annals of the drama was play so successful. After the *Cid* came *Horace*, *Cinna*, and *Polyeucte*, the last being probably his *chef d'œuvre*. The characteristic qualities of Corneille's plays are grandeur and heroism—qualities which afterwards degenerated into harshness and stiffness.

Racine's (1639-99) first piece, *Les Frères ennemis*, was produced in 1664. In 1667 he brought out *Andromaque*, which was immensely successful. Then came *Les Plaideurs* (a comedy), *Britannicus*, *Bérénice*, *Bajazet*, *Mithridate*, *Iphigénie*, and *Phèdre*. In 1677 he renounced writing for the stage. Twelve years later he wrote *Esther* at the request of Madame de Maintenon. It was performed by the young ladies of her aristocratic school at St. Cyr. In 1691 he produced his masterpiece, *Athalie*, which fell flat.

Molière (1622-73), whose real name was Jean-Baptiste Poquelin, started a company in conjunction with the Béjart family. In 1659 appeared *Les Précieuses Ridicules*, and from that date onwards his pieces followed in rapid succession. Some of his plays are among the masterpieces of Europe—*Le Misanthrope*, *Tartuffe*, *L'Avare*. Time, which has dimmed the luster of French tragedy, has left Molière untouched. His mental attitude with regard to religion and morals has always been the attitude of the French *bourgeoisie*—more inclined to discover hypocrisy than to share enthusiasm. His last play, *Le Malade Imaginaire*, was written in 1673. La Fontaine (1621-95) is a writer who will probably always be more thought of in France than elsewhere. The beasts in La Fontaine's fables are so very French, so clever, so witty, that they almost cease to be animals.

The 17th century in France is rich in three classes of writers—moralists, writers of memoirs, and writers of sermons. Among moralists, besides Rabelais and Montaigne, we have

that remarkable writer Pascal (1623-62). His *Provincial Letters* (1656) are usually spoken of as having given a death-blow to the Jesuits. Descartes (1596-1650) is the philosopher whose thought dominates all the 17th century in France. His famous *Discours sur la Méthode* (1637) formed the philosophic basis for the art and literature of the reign of Louis xiv.

Among the writers of *mémoires* the name of Cardinal de Retz (1614-79) stands prominent. La Rochefoucauld (1613-80) relates the events that happened between 1624 and 1652. Among the memoir writers of the age must be mentioned Madame de Motteville (1621-89), Mdle. de Montpensier (1627-93), and Madame de Sévigné. The three great French preachers of the reign of Louis xiv. are Bossuet, Bourdaloue, and Massillon.

The second half of the 17th century had produced new forms of literary art, and it only remained to theorize them. This task was undertaken by Boileau (1636-1711), who assumed the name of Despréaux, and became the friend of Racine and Molière. His *chef-d'œuvre* is his *Art Poétique*. In it he lays down the principle of an immutable and impersonal criterion in poetry. Reason, and not imagination, is the guiding genius, and fidelity to nature is the aim. 'Rien n'est beau que le vrai, le vrai seul est aimable.' Towards the end of the reign of Louis xiv. there are three writers who mark a period of transition. These are Fénelon, La Bruyère, and Saint-Simon.

With the 18th century a new spirit came into existence. The literature of the preceding age has dealt mainly with man considered as an individual; the 18th century began to consider society as a whole. As before, the influence of *salons* makes itself felt. La Duchesse du Maine, la Marquise de Lambert, Madame Geoffrin, Madame du Deffand, Mademoiselle de Lespinasse—these ladies all had *salons*, each differing in kind from the other. Fontenelle (1657-1757) was the great *bel esprit* of the day. His best-known work, *Entretiens sur la Pluralité des Mondes* (1686), is an epoch-making book. It is the first attempt at what the French call *vulgarisation*.

Bayle (1647-1706) represents the connecting link between Montaigne and Voltaire. His famous *Dictionnaire* (1695) was the forerunner of Diderot's *Encyclopédie*. The name which dominates all others in the 18th century is Voltaire. Hailed by his contemporaries as a god and tasting to the full the sweets of glory, he has left nothing behind him so likely to endure as his name. His written work is in large part dead, but it was

deadly. The church in France never really recovered from his onslaughts. The great mass of French people are Voltairean to this day. That is surely a remarkable tribute to the extent of his influence. In Marivaux (1688-1763) we come to a really original writer. His best works lie between 1730 and 1740—*Le Jeu de l'Amour et du Hasard*, *Les Serments Indiscrets*, *L'Heureux Stratagème*, *Le Legs*, etc. The principal innovation in the work of Marivaux is the importance given to love-making.

With Beaumarchais (1732-99) we return to the Molière conception of comedy. The only innovation in the great master's work is the introduction of political satire. Figaro is the great creation of Beaumarchais. The famous *Barbier de Séville* was produced in 1784, and had enormous success.

In the forefront of the 18th century stand the names of Montesquieu and Buffon. Montesquieu (1689-1755) made his début in the world of letters with his *Lettres Persanes*. They had a huge success, forming, as they do, a brilliant piece of political satire. His next book, *Considérations sur la Grandeur et la Décadence des Romains* (1734), is the first specimen of a philosophy of history from which theology is excluded. His last book, *L'Esprit des Lois* (1748), is the first one in which jurisprudence enters as matter of literature. Buffon (1707-88) performed for natural history what Montesquieu did for jurisprudence. He brought it into literature. His *Histoire Naturelle* appeared in 1749. The *Encyclopédie* formed a sort of center for the leading minds of the 18th century. Most of the contributors to that famous work were but mediocre writers, with the exception of one, Diderot.

The name next in importance to Voltaire's is, without doubt, that of J. J. Rousseau (1712-78). He began his literary career with an attack on science and art (*Discours sur les Sciences et les Arts*), which worked such havoc in men's minds with the idea of an *état de nature* which never existed. His novel, *La Nouvelle Héloïse*, made an enormous sensation; and his treatise on education, *Emile* (1762), produced a very wide effect. The same may be said of his *Contrat Social* (1762), which was a powerful factor in the minds of the revolutionaries of 1789. Rousseau's best disciple was Bernardin de St. Pierre (1757-1814). English and French critics will never be able to agree over the famous prose idyll, *Paul et Virginie* (1787).

An account of the literature of the 18th century in France would not be complete without a reference to three more writers at least.

These are Le Sage (1668-1747), L'Abbé Prévost (1697-1763), and André Chénier (1762-94). Le Sage, like Saint-Simon, is a survival into the 18th century of the spirit of the 17th. He is not preoccupied with moral ideas, and is contented with portrait-painting. He may be said to have inaugurated the novel of manners in his famous *Gil Blas*. L'Abbé Prévost may, in like way, be called the creator of the love novel in *Manon Lescaut* (1733). André Chénier brought into the arid world of 18th-century poetry a breath from ancient Greece.

With the 19th century a renaissance takes place in French literature. We are still too near it to appreciate strictly the place which its great writers hold, but we may divide the century into three main periods. The first is the period of preparation, the period of the empire; the second, from 1820 to 1850, is that of the highest creative activity; and the third is that of reaction against the romantic and lyrical tendencies of the previous period.

The great initiator of literature in the 19th century is Chateaubriand (1768-1848). Chateaubriand's most celebrated work is *Le Génie du Christianisme*—the book which brought into literature the enchantments of the middle ages. Madame de Staël (1766-1817), on the other hand, represents the continuation of the ideas of the revolution. Her greatest work is *De l'Allemagne* (1810). It was she who first made Germany known in France. The second period may be said to open with *Les Méditations* of Lamartine (1790-1869). Lamartine is regarded by many as the greatest poet France has produced. Others would say that the palm belongs to Victor Hugo (1802-85). This astounding writer is perhaps the most complete personification of the 19th century in France. His first work, *Odes et Ballades*, marked him out as a leader in poetry. *Les Orientales* are a date. In *Les Feuilles d'Automne*, *Les Chants du Crépuscule*, *Les Voix Intérieures*, *Les Rayons et les Ombres*, and *Les Contemplations*, the poet enters upon his inheritance. Perhaps the finest part of his work is to be found in *La Légende des Siècles*. His play *Hernani* (1830) formed the battle-ground of the romanticists and classicists, and gave Théophile Gautier an opportunity for making himself conspicuous. Hugo's novels, *Notre Dame de Paris*, *Les Misérables*, and *Les Travailleurs de la Mer* contain fine passages. He is certainly the greatest French epic poet.

Although Hugo's is perhaps the greatest name in French poetry, that of Alfred de Musset (1810-57) is one more intimately loved perhaps by most Frenchmen. His best-known

work, such as *Les Nuits* and *L'Espoir en Dieu*, is much more classical in tone than romantic. Alfred de Vigny (1797-1863) is one of those poets who have been better appreciated after their death than during their lifetime. *La Mort du Loup* is perhaps his best-known poem.

Théophile Gautier (1811-72) it was who stated the famous 'art for art' formula, and no one acted up to it better than he did. His *Emaux et Camées* exemplifies this theory. But it is as a prose writer that he is chiefly to be remembered. His preface to *Made-moiselle de Maupin* is a masterpiece of criticism.

The 19th century has been great in history: Thierry, Guizot, Thiers, Mignet, Michelet, Renan, Taine, Fustel de Coulanges are all great names. Thierry (1795-1856) started French history on a new basis. His masterpiece is probably the *Récits des Temps Mérovingiens*. Guizot (1787-1874) may be said to have created history as a social science based on accurate research. Renan (1823-92) is perhaps the finest prose writer of the 19th century in France. He wrote *Histoire des Origines du Christianisme*, one volume of which (*La Vie de Jésus*) roused a storm in ecclesiastical quarters. Taine (1828-93) is chiefly a philosopher. He discards metaphysics, and tries to apply the method of the natural sciences to history and literature. In his *Origines de la France Contemporaine* we see his method rigorously applied. Fustel de Coulanges (1830-89) wrote two books, *La Cité Antique* and *L'Histoire des Institutions Politiques de l'Ancienne France*. Criticism in the 19th century is best represented by Sainte-Beuve (1804-69). His large and luminous intelligence seemed capable of understanding any writer. His *Portraits Littéraires* and his *Causeries du Lundi* are marvels of critical power.

Among the novelists of the 19th century some great names stand out. Of Hugo we have already spoken. George Sand (1804-76) is one of the greatest woman novelists that ever lived. From *Indiana* we reach *La Mare au Diable* by way of *Consuelo*. Henry Beyle, alias 'Stendhal' (1783-1842), is the first psychological novelist, and a very remarkable writer. His two chief works are *Le Rouge et le Noir* and *La Chartreuse de Parme*. His description of the battle of Waterloo in the last-mentioned work is famous. Prosper Mérimée (1803-79) is chiefly known for his masterpiece *Colomba*, a tale of Corsican vendetta. Balzac (1799-1850) is the greatest master of realistic fiction that France has seen. He called his work *La Comédie Humaine*. He excels in depicting one

in whom some quality has become dominant and tyrannical. His *Père Goriot*—perhaps his masterpiece—shows this admirably. Flaubert (1821-80) combines romanticism and realism. He is, on the whole, perhaps the greatest master of style that France has produced. His two greatest works are *Salammbô*, a Carthaginian romance, and *Madame Bovary*, a story of provincial life.

From Flaubert and Taine there has sprung the 'naturalist' school, of which Zola (1840-1903) is the chief exponent. Among its members are Alphonse Daudet, Octave Mirabeau, Guy de Maupassant, J. K. Huysmans. The latter part of the 19th and the first part of the 20th centuries witnessed a reaction against the school of Zola. Outstanding figures in French literature of this period were Maurice Barrès (1862-1923) and Paul Bourget (1852-1935).

Anatole France (1844-1924) was generally considered the leading man of contemporary letters in France; as a master of style he was unexcelled. Pierre Loti (1850-1923) wrote of exotic love and of the sea. Other recent writers of note are Paul and Victor Margueritte; Octave Feuillet; Edouard Rod; Marcel Prévost; René Bazin, a novelist of rustic life; and Jules Lemaitre.

Romain Rolland, with his ten-volume biographical *Jean-Christophe* (1904-12), produced, in some respects, the most notable French novel of his generation. Recent poetry finds its chief exponents in Paul Fort, Comtesse de Noailles, Charles Péguy.

In the dramatic field, among the chief figures of modern French literature are Victorien Sardou (1831-1908), who wrote some sixty plays, ranging from deepest tragedy to sparkling comedy, including *Fedora*, *La Tosca*, *Madame Sans-Gêne*; Dumas fils (1824-93), whose *La dame aux camélias*, one of the first of the 'problem' plays, has enjoyed immense popularity; Eugene Brieux (1858-1932), a sincere reformer, broad-minded and earnest, among whose works are *Maternité*, *Les trois filles de M. Dupont*, *Simone*, and *La robe rouge*; and Edmond Rostand (1868-1918), the brilliant author of *Cyrano de Bergerac* and *L'Aiglon*. Henry Bernstein (1876-), Henri Bataille (1872-1922), Maurice Dounay (1860-), Pierre Wolff (1865-), and Henri Lavedan (1859-1940) are also notable dramatists. Paul Hervieu (1857-1917) is the most distinguished writer of tragedy.

In the field of philosophy the name of Henri Bergson stands pre-eminent. His *L'Évolution créatrice* is a full and complete statement of

his metaphysical attitude and a shining example of poetic and powerful style.

Of the more recent novels mention can be made of Barrès *Jardin sur l'Oronte*; Duhamel *Vie des Martyrs*; Estaunié *Au bord de la route*; Morand *Ouvert la nuit*; Proust *A la recherche du temps perdu*. Literary biography has been successful in recent years. Maurois' *Ariel*, *Vie de Shelley* started the movement. In the year 1929 appeared an anthology *Les poètes du XX^e siècle*, by Gossez. In 1930, Marie-Louise Pailéron, founder of the *Revue des Deux Mondes*, who was awarded the *Grand Prix de littérature*, by the Academy, published *François Buloz et ses amis*, *La Revue des Deux Mondes et la Comédie Française*. One of the most praised single volume novels of the year 1933 was Marcel Prévost's *Ebronie*. Notable also are the works of François Mauriac and Jules Romains.

From the language of the Strassburg oaths (843) to that written by Rostand there is an immense way. French was the outgrowth, however, not of the literary Latin of Cicero, but of the colloquial Latin of the Roman settlers in Gaul. There popular Latin falling into the hands of two rival races, one in the north and the other in the south, produced two distinct idioms—that of the south being called the *langue d'oc* (see *PROVENÇAL LANGUAGE AND LITERATURE*), and that of the north the *langue d'oïl*.

There were in the Middle Ages four principal dialects of the langue d'oïl—Norman, Picard, Burgundian, and, in the center of the triangle formed by these three, French (the language of the Ile de France). Each of these dialects had its own literature. It was the election of Hugh Capet, duke of France, to be king, making Paris the capital of France, that assured the sovereignty of the dialect of the Ile de France. Gradually the other dialects became mere *patois*, and by the 14th century the transformation was complete.

Consult Brunetière's *Manual of the History of French Literature*; Bury's *French Literature of Today*; Doumic's *Contemporary French Novelists*; Dowden's *A History of French Literature*; Hudson's *A Short History of French Literature* (1919); Des Granges' *An Illustrated History of French Literature* (1921); Nitze and Dargan's *A History of French Literature from the Earliest Times to the Great War* (1922); J. Bédier and P. Hazard's, *Histoire illustrée de la littérature française* (1923-24); M. Braunschwig's *La Littérature française contemporaine* (1926); O. Morner's *Histoire de la littérature et de la pensée françaises contemporaines* (1927);

Hugo P. Thieme's *Bibliographie de la littérature française de 1800 à 1930* (1933).

France, Anatole (1844-1924), French writer, whose real name was Jacques Anatole Thibault, was born in Paris. His first novel, *Le crime de Sylvestre Bonnard*, published in 1881, strengthened the foundations of his fame, and his subsequent works made him the acknowledged leader of contemporary French letters, famous alike as a critic, a novelist of rare distinction, and a keen and mordant satirist. In 1921 he was awarded the Nobel prize in literature. Among his works are *Thaïs* (1890); *Le lys rouge* (1894); *Le livre de mon ami* (1905); *L'Île des penguins* (1908); *La vie de Jeanne d'Arc* (1908); *Les dieux ont soif* (1912); *Le révolte des anges* (1914); *La vie en fleur* (1922). There are English translations of most of his works.

France, Ile de. See *Mauritius*.

Francesca da Rimini (?—c. 1288), daughter of Guido da Polenta, lord of Ravenna, became the wife of the deformed Gianciotto, the son of Malatesta da Rimini, a leader of the Guelph faction, as a means of bringing about a reconciliation between the two warring families. Paolo, the bridegroom's handsome younger brother, was sent to escort the bride and they fell violently in love. Giovanni surprised the guilty lovers in Francesca's chamber and murdered them both.

Francesco di Paula (1416-1507), founder of the order of Minims, was born in Paula or Paola, in Calabria. Many miracles are ascribed to him, and King Louis XI. of France died in his arms. He was canonized by Leo X. in 1519.

Franche-Comté, former province of France. Its ancient name was Comté de Bourgogne.

Franchise. In English law the terms franchise and liberty are synonymous, meaning a royal privilege in the hands of a subject. In modern times the most important franchise is the grant of a corporation. By this franchise certain important advantages are enjoyed which are not enjoyed by unincorporated associations of individuals, the chief of which are perpetual succession, and, generally, limited liability. The franchise of a street railway company is often more valuable than its aggregate tangible assets. Such franchises were formerly granted gratuitously, often in perpetuity, or for a period of 999 years. In recent years the public has come to a better realization of the value of franchises, and in many cases demands the limitation of the term of the franchise to twenty or twenty-five years.

Francia, or **Francesco Raibolini** (1450-1517), Italian painter, was born in Bologna. His earliest dated work is the *Madonna and Child* in the gallery at Bologna. He painted many other pictures of the Virgin, as well as several portraits and frescoes.

Francia, José Gaspar Rodriguez de (1757-1840), dictator of Paraguay, was born in Asuncion. Absolute prohibition of foreign intercourse, even of a commercial nature, was a feature of his policy. He abolished the Inquisition, and adopted at the same time strong measures for the repression of all religion.

Francillon, Robert Edward (1841-1919), English novelist and journalist. In 1868 his first novel, *Grace Owen's Engagement*, appeared in *Blackwood's Magazine*. Later works are *Gods and Heroes* (1895); *Mid-Victorian Memories* (1913).

Francis, St., of Assisi (1182-1226), founder of the Franciscan order, was born in Assisi, the son of Pietro Bernardone, a wealthy travelling merchant. As a youth he was one of the leaders among the young nobles of Assisi, and in 1201 took part in a military expedition against Perugia, which resulted in a year's captivity. After his release, when in his twenty-second year, he was attacked by a severe illness. Upon his recovery Francis retreated daily into the caves and holes of the rocks to struggle with his soul. At last, the victory won, the young man dedicated himself to a life of poverty and penance, consecrating himself wholly to the service of Christ. His example was soon followed by others. A rule of life was drawn up enjoining chastity, obedience, and poverty, even to the renunciation of all worldly possessions, and the foundations of the great Franciscan order were laid. The authorization of the new order by Pope Innocent III. was formally granted in 1216.

In 1219, setting out on a missionary journey to Egypt and Palestine, Francis preached both to the crusading armies and to the inhabitants. Recalled to Italy in 1220, he found that great changes had been effected in regard to multiplication of rules and relaxation of the vow of poverty; while academic learning, which was foreign to the Franciscan principle, was also being encouraged. Francis waged war with inexorable determination against the new tendency, but the fight was an unequal one. In 1224, occurred the miracle of the stigmata, concerning the authenticity of which much controversy has arisen—Francis receiving, while in an ecstasy of prayer, in the high solitude of Monte Alvernon, the marks on his own body of the wounds of Christ.

He died, two years later, in Assisi, Oct. 3, 1226, and was canonized by Pope Gregory IX. in 1228. His works—including correspondence, sermons, hymns, and other literary remains—were published in 1739. The *Cantico delle Creature* ('Song of Creation') is the most celebrated of his poems. Consult *Lives* by St. Bonaventura, Hase, Paul Sabatier, Mrs. Oliphant, Le Monnier, Cuthbert, and Egan; Butler's *Lives of the Saints*; Herkless' *Francis and Dominic*; Carmichael's *The Lady of Poverty*.

Francis, St., of Sales (1567-1622), Roman Catholic preacher and devotional writer, was born in Sales, near Annecy, France. He entered the priesthood in 1591, and in 1602 became bishop of Geneva. The chief literary work of St. Francis of Sales was the *Introduction à la Vie Devotée* (1808; Eng. trans. 1885), which won for him a reputation throughout the whole of Christendom, and is to-day one of the most popular of all Roman Catholic devotional works. It was followed in 1616 by the *Traité de l'Amour de Dieu*. Francis was canonized in 1685 by Pope Alexander VII., January 29 being dedicated to him. Consult *Lives* by Hamon, Pérennes, Camus, and Lear.

Francis I. (1494-1547), king of France, was the son of Charles, Count of Angoulême and Louise of Savoy. Immediately upon his accession, Francis undertook to restore Milan, which had been lost to France under Louis XII.; he won a brilliant victory at Marignano (1515), which resulted in an arrangement with the Pope known as the Concordat of Bologna (1516), whereby ecclesiastical appointments in France were to all practical purposes left in the hands of the king. On the death of the German Emperor Maximilian, in 1519, Francis aspired to the Imperial crown, but the election fell to Charles of Austria, who became Charles V. The remainder of Francis' reign was given over to warfare against his successful rival (see FRANCE).

Francis II. (1543-60), king of France, succeeded to the throne on the death of his father (Henry II.) in 1559, and reigned one year. In 1558 he had married Mary Queen of Scots.

Francis I. (1708-65), Holy Roman emperor (1745-65), was the son of Leopold, Duke of Lorraine, and in 1736 married Maria Theresa of Austria, who succeeded to the Austrian throne in 1740. He was elected Holy Roman Emperor in 1745.

Francis II. (1768-1835), last emperor of the Holy Roman Empire (1792-1806), and first emperor (1804-35) of Austria (as Francis I.), was born in Florence and succeeded his father,

the Emperor Leopold II. Immediately upon his accession he became involved in war with France (April 1792), and in 1797 he was forced to sign the peace of Campo Formio, by which Austria ceded to France the Lombard provinces and Flanders, receiving in return Venice and a part of Bavaria. In 1798 Francis embarked upon a second war with France, which was concluded by the peace of Luneville (1801), leaving France in possession of the left bank of the Rhine. In 1804 he assumed the title of Emperor of Austria, and the following year joined England and Russia in a coalition against France. Following Napoleon's victory at Austerlitz (December 1805), Francis abdicated the imperial crown of Germany, and the Holy Roman Empire ceased to exist (1806). In 1809, as Emperor of Austria and King of Bohemia and Hungary, he again entered into war against Napoleon. His forces were totally defeated at Wagram, and he was forced to sign the peace of Schönbrunn. In 1810 Francis' daughter Maria Louisa was married to Napoleon, and for a time peace was maintained, but in 1814 Austria allied herself with Russia and Prussia against France. Upon the fall of Napoleon, following the battle of Waterloo, she regained much of her lost territory and joined the Holy Alliance.

Francis, David Rowland (1850-1927), American public official, was born in Richmond, Kentucky. He was mayor of St. Louis in 1885-9, governor of Missouri in 1889-93, and was made Secretary of the Interior (1896-7) by President Cleveland. From 1916 to 1921 he was Ambassador Extraordinary and Minister Plenipotentiary to Russia.

Francis, Joseph (1801-93), American inventor, was born in Boston, Mass. He invented many devices in connection with life-saving apparatus, being the first to make life-boats of iron, with air spaces at bow and stern. His metallic life-car, devised in 1842, was instrumental in saving many lives.

Francis, Sir Philip (1740-1818), English public official, reputed author of the *Junius Letters*, was born in Dublin.

Franciscans, Minorites, or Lesser Brethren, a religious order founded in 1209 by St. Francis of Assisi. The regulations prescribed by St. Francis were severe in the extreme, and the members of the order would have been mendicants had they acted up to the founder's stern rule of poverty. Even during the life of St. Francis controversies on this injunction arose, and after his death the relaxations decreed by successive Popes gave rise to various divisions of the order. In 1517 Pope Leo X.

recognized two of these divisions, the Observantists and the Conventuals, who, with the Capuchins, originating a few years later, are the survivors of a much more numerous division. The Franciscan institute includes also several orders of nuns, which owe their origin to Clare, a noble maiden of Assisi. (See CLARE, St.)

An important feature of the organization of the Franciscan order, as it subsequently became of other orders, is the enrollment of non-conventual members, who continue to live in society without the obligation of celibacy; and in general are bound only by the spirit, and not the letter, of the rule. They are called 'Tertiaries,' or members of the Third Order of St. Francis. A long array of distinguished theologians and churchmen have belonged to the Franciscan order, including Bonaventura, Alexander of Hales, Duns Scotus, and William of Occam.

Early in the 18th century the Franciscans numbered nearly 120,000 friars with 7,000 houses, and some 30,000 nuns, with 900 convents. These numbers are now considerably reduced, but the order remains one of the strongest of the Roman Catholic Church. Consult Brewer's *Monumenta Franciscana*; Currier's *History of Religious Orders*; Cusack's *St. Francis and the Franciscans*; Herkless' *Francis and Dominic*; MacDonnell's *Sons of Francis*.

Francis Ferdinand, Archduke, of Austria (1863-1914), nephew of the Emperor Francis Joseph, was born in Gratz. He became heir to the throne on the renunciation of the claim by his father, the Archduke Charles Louis, next in succession after the Crown Prince Rudolph, whose death occurred in 1889. In 1900 he contracted a morganatic marriage with the daughter of a Bohemian nobleman, Countess Sophie Chotek, who was later created Duchess of Hohenberg. On June 28, 1914, the Archduke and his wife were shot and killed by a Serbian sympathizer at Sarajevo, Bosnia, an event which precipitated the Great War of Europe. See AUSTRIA, *History*.

Francis Joseph I. (1830-1916), emperor of Austria, son of the Archduke Francis (son of Francis I.) and the Archduchess Sophie (daughter of Maximilian I. of Bavaria), was born at Schönbrunn, and succeeded his uncle Ferdinand, who had been forced to abdicate, on Dec. 2, 1848. Hungary was subdued in 1849, and the insurgents in Italy were also put down. Early in 1859, aided by the French, the Italians wrested Lombardy from Austria. In 1866 the question of the headship of Germany was

decided in favor of Prussia on the field of Sadowa; and Austria was, moreover, forced to cede Venetia to Italy. The Austrian empire being no longer based upon the theory of German ascendancy, it was inevitable that the relations of Austria and Hungary should be rearranged. By the famous 'Compromise' an Austro-Hungarian state was formed, and in June, 1867, the Emperor Francis Joseph was crowned at Budapest with the crown of St. Stephen. Thenceforth Francis Joseph set aside the traditional Hapsburg policy of absolutism, and adopted one of conciliation toward the varied nationalities comprised in the empire.

Frack, César Auguste (1822-90), French musical composer, a native of Liège. In 1873, his oratorio *Rédemption* inaugurated a period of increasing fame, which continued until his death. During this period he produced *Les Béatitudes* (1870-80), an oratorio; symphony in D (1889), *Variations Symphoniques*, also other works for orchestra and for piano; songs, including *Les Cloches du Soir*; and the operas *Hulda* and *Ghiselle*, performed after his death. Consult *Lives* in French by Derepas, Baldensperger and D'Indy (Eng. trans. 1909).

Frankke, Kuno (1855-1930), German-American educator, was born in Kiel, Germany. He was instructor (1884-7), assistant professor of German (1887-92), assistant professor of German literature (1892-6), and professor of the history of German culture (after 1896) at Harvard University, and after 1902 curator of the Germanic Museum there. Besides several works on classical subjects, he published: *Social Forces in German Literature* (1896); *History of German Literature* (1901); *German Ideals of To-day* (1907); *A German-American's Confession of Faith* (1915), etc.

Franco, Francisco (1892-), Spanish. general, revolutionist, and dictator. He attended the military schools at the Alcazar and Toledo and was commissioned in 1909. He fought against the Riffs in Morocco, was wounded once, and was cited several times for bravery. In 1923 he married the wealthy Carmen Polo and in 1926 attended L'Ecole Militaire at Paris. He became a captain at 20, a major at 23, and a general at 32. He was satisfied under the monarchy but was angry at the republic because of its interference with the army. Franco was head of the military school at Zaragoza in 1933 when the cabinet closed it. He was transferred to the Balearics and to Morocco in

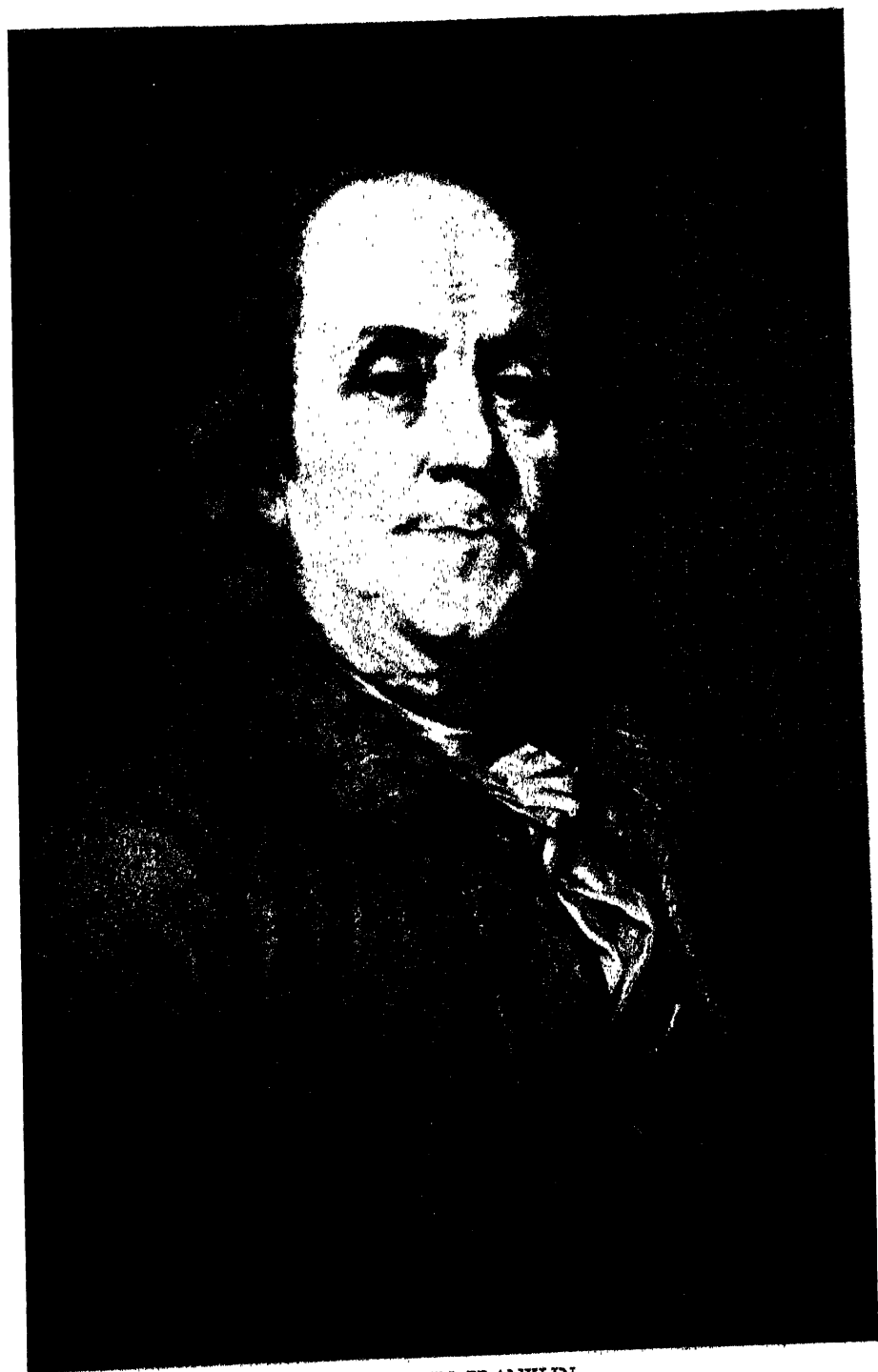
1934. In 1935 he was recalled home and was appointed chief of staff when the government swung 'right.' A political change the next year 'exiled' him to the Canary Islands. Soon thereafter he flew to Morocco and helped organize the revolt against the 'leftist' government. His co-conspirators, Generals Sanjuro and Goded, were killed in the early days of the Civil War and Franco became the supreme head of the revolt. At the end of the war in 1939, Franco assumed dictatorial powers.

Franco-German War (1870-71). In 1870 the suggestion that a Hohenzollern prince was likely to become king of Spain roused French feeling. Though the Hohenzollern candidature was withdrawn, Benedetti, the French ambassador, demanded from King William of Prussia at Ems a guarantee that no prince of Hohenzollern would be allowed to accept the crown of Spain. Bismarck published, with certain omissions, a telegram which he received from William, giving an account of the interview; and French public opinion demanded war, which was formally declared by France against Prussia on July 19. Southern Germany joined Prussia, and Austria and Italy maintained neutrality.

The French had with difficulty collected 270,000 men with 925 guns by the beginning of August. Napoleon assumed the chief command, and the first engagement took place on Aug. 2, when Frossard's corps drove out the German detachment in Saarbrücken. On Aug. 4 the third army on the German left met Douay's advanced brigade near Weissenburg, defeated him, and pressed on to Wörth, where MacMahon had taken up a strong position. The battle fought here on the 6th was disastrous to the French, who fled in confusion. On the same day the Battle of Spicheren was fought between 67,000 of the first German army and 32,000 of Frossard's corps, and ended in the orderly retreat of the latter.

As a result of these disasters the Emperor found it necessary to retire toward Metz. On the 18th the pitched battle of Gravelotte was fought, and resulted in the French being driven back on Metz. Here they were surrounded, and, after several gallant efforts to break out, surrendered on Oct. 27.

Meantime the Gardes Mobiles had been called out, and with the remains of MacMahon's army formed at Châlons a body of 120,000 men, with 324 guns, much disorganized. An attempt to join hands with Bazaine by a northerly march was commenced on



BENJAMIN FRANKLIN

Aug. 21; but on the 30th the fifth corps under De Failly was surprised and driven northward on Sedan. A fierce battle commenced early on Sept. 2 and by noon MacMahon had been wounded. Next day the Emperor, who was with the army, surrendered with 83,000 men.

The news of Sedan led to a revolution at Paris. The Empress fled, and a government of National Defence was set up. On Sept. 15 the army of the Crown Prince of Prussia arrived before Paris, and the siege of the French capital began. Meanwhile in various parts of France efforts were made to defeat the German armies; but in spite of occasional successes, victory declared itself on the side of the Germans. The city underwent a bombardment for several days, from which, however, it suffered little, and it was not until January 1871, after a four months' investment, that negotiations were opened with the enemy at Versailles.

Peace was signed at Frankfurt-on-the-Main on May 10, 1871. Alsace-Lorraine, Metz, and Strassburg were ceded by France, and a war indemnity of \$1,000,000,000 was imposed on the conquered country, which was occupied by German troops till the money was paid. This enormous obligation was discharged in September, 1873. See FRANCE, *History*; GERMANY, *History*. Consult Von Moltke's *Franco-German War* (Eng. trans.); F. B. Maurice's *The Franco-German War* (new ed. 1909).

Francolin (*Francolinus*), a genus of birds of the grouse family closely allied to the partridge.

Franconia. On the break-up of the Carolingian empire (see CARLOVINGIANS), the East Frank realm, or Austrasia, fell into four divisions, which were known as the duchies of Franconia, Saxony, Bavaria, and Swabia. With the death of the Emperor Conrad I. in 918 the Franconian dynasty ended. In 1501, when Maximilian I. divided Germany into circles, he used the term Franconia to denote one of the circles. At the present time it is represented by the Bavarian divisions of Upper, Middle, and Lower Franconia.

Franconia Notch, a wooded defile, now part of a State Reservation, in the Franconia Mountains, a western group of the White Mountains. It is 5 m. long, and is traversed by the Pemigewasset River, which passes through a narrow gorge 700 ft. in length known as 'the Flume.' At the upper end of the Notch is Profile Mountain (4,114 ft.), from the side of which projects the curiously formed ledge known as 'the Old Man of the Mountain.'

Franco-tireurs ('free shooters'), armed

bands of French peasants and others that sprang into existence during the progress of the Franco-German War.

Franeker, town, Netherlands, in the province of Friesland. The sixteenth-century town hall contains an eighteenth-century Planetarium, constructed by Eise Eisinga; p. 7,785.

Frangipani, a famous family of the Roman nobility, dates its authentic history from



Old Man of the Mountain, Franconia Notch, White Mountains.

Leo Frangipani in 1014. CENCIO FRANGIPANI was one of the leaders of the Ghibelline party early in the twelfth century.

Frank, Glenn (1887-1940), American editor and educator. He was made associate editor of the *Century Magazine* in 1919, and editor-in-chief in 1921, resigning in 1925 to become president of the University of Wisconsin. On charges of incompetence and extravagance, the regents of the University voted his removal in 1937. He later became chairman of the program committee of the Republican national organization.

Frankalmoin, or Free Alms, an ancient tenure in England whereby a religious corporation may hold lands under an obligation to perform certain pious or spiritual services. See TENURE.

Frankenstein, in the romance of that name, written in 1816-18 by Mrs. Shelley (Mary Godwin) in imitation of the old German stories of the supernatural, is the mortal who, having by the resources of natural science, created a being in the form of man, is tormented by the monster of his own creation.

Frankfort, city, Kentucky, capital of the State and county seat of Franklin co., on both banks of the Kentucky River. Franklin Cemetery, in which Daniel Boone is buried, is a

point of interest. Frankfort is a shipping point for the surrounding 'Blue Grass' district. It was settled in 1786, and in 1792 became the State capital; p. 11,492.

Frankfort-on-the-Main (German *Frankfurt-am-Main*), city, Prussia, in the province of Hesse-Nassau, on the right bank of the Main. In the older part of the city, adjacent to the river, many of the buildings and streets retain their mediæval characteristics. Notable features in this section are the house in which Goethe was born, with a Goethe museum attached; the Römer, a group of twelve mediæval houses serving as the town hall, and including the hall in which the German kings were elected; the cathedral of St. Bartholomew, founded about 870 and rebuilt in the 13th and 14th centuries, in which after 1562 the German emperors were crowned; the house in which Schopenhauer lived; and the ancestral house of the Rothschild family, the sole remaining relic of the Jewish quarter of the city, the famous *Judengasse*.

Frankfort is a strong financial and commercial center. Its manufactures include machinery, hats, perfumes, chemicals, and tobacco. Printing and brewing are carried on, and market gardening is important. Two annual fairs attract large numbers of visitors and traders; p. 547,000.

The first historical notice of the town occurs in 793, when it is recorded that Charlemagne spent the winter in the villa Frankonuvard. In 843 it was made the capital of the East Frankish Kingdom. From 1152 to 1806 the German emperors were chosen, and from 1562 crowned, in Frankfort. From 1816 to 1866 it was the meeting place of the German Diet and in 1848-9 of the National Assembly. It was incorporated into the Prussian province of Hesse-Nassau in 1866 and five years later was the scene of the signing of the peace treaty ending the Franco-German war. During the difficulties in the Ruhr district, following the Great War, French troops occupied Frankfort from April 6 to May 17, 1920.

Frankfort-on-the-Oder, town, Prussia, in the province of Brandenburg, on the Oder, 50 m. s.e. of Berlin. Notable features of the city are the town hall (1607-10), the church of St. Mary (15th century), Lienau House, containing art and natural history collections and statues of William I., Heinrich Von Kleist, and Prince Frederick Charles of Prussia. Frankfort is well known for its three fairs, and as a center of trade with Poland. From 1506 to 1811 it was the seat of a university, now at Breslau; p. 70,884.

Frankfurter, Felix (1882-), American lawyer and educator born in Vienna, Austria. In 1894 he came to the United States and after 1914 was professor of law at the Harvard Law School. During the World War he acted as major and judge-advocate, as assistant Secretary of War, and as secretary and counsel of the President's Mediation Commission. He was chairman of the War Labor Policies Board, in 1918, and was also a member of the board of directors of the Institute for Government Research. He is the author of several books including *The Case of Sacco and Vanzetti* (1927). He became a member of the U. S. Supreme Court in 1939.

Frankincense (*Olibanum*), a gum resin obtained from *Boswellia carterii*, of the order Burseraceæ, and brought chiefly from Somaliland. It occurs in roundish tears, about half an inch in diameter, colorless to reddish, covered with a white powder; its odor is balsamic, and its taste bitter. It burns with a fragrant odor, and is used in incense, fumigating powders, etc.

Franking of Mail Matter, or its despatch free of postage, is a privilege granted under the postal regulations of the United States to certain government officials in the case of public documents or official correspondence. The name of the official exercising this privilege must be written upon such matter.

Frankland, Sir Edward (1825-99), English chemist, was born in Churchton, near Lancaster. Among his contributions to chemical science was the 'Theory of Valency'—the conclusion that each atom of an elementary substance possesses a clearly limited power of saturation, so that only a correspondingly limited number of atoms of other elements can be attached to it. His name is associated with that of Sir Norman Lockyer in spectroscopic researches, which resulted in the conclusion that the photosphere of the sun is gaseous. The discovery of helium in the sun was also the result of their joint labors.

Frankland, Percy Faraday (1858-), English chemist, was born in London. His chemical investigations are chiefly in the domain of stereochemistry. He received the Davy Medal of the Royal Society for Chemistry in 1919. Among his publications are *Agricultural Chemical Analysis* (1883); *Our Secret Friends and Foes* (1894); *Micro-organisms in Water* (1894); and *Life of Pasteur* (with Mrs. Frankland, 1897).

Franklin, in feudal England the owner of freehold land—land free from the ordinary

dues paid to a feudal lord and held direct from the sovereign.

Franklin, city, New Hampshire, Merrimac co., on the Merrimac River. Franklin was the birthplace of Daniel Webster; p. 6.749.

Franklin, Battle of, a stubbornly contested battle of the Civil War, fought on Nov. 30, 1864, at Franklin, Tenn., between General Schofield with a force of 29,000, and a Confederate force of 41,000 under General Hood. The battle is considered to have been tactically drawn; the Federal loss was about 2,300, the Confederate, about 6,300. A number of other actions took place at Franklin. On April 10, 1863, a Federal Force under General Granger repulsed an attack led by General Van Dorn. Consult Johnson and Buel's *Battles and Leaders of the Civil War* (4 vols.); Cox's *Battle of Franklin, Tenn.*; Schofield's *Forty-six Years in the Army*.

Franklin, or Frankland, State of, a name given to an extra-legal government established in 1784 by the settlers in what is now East Tennessee, then owned by North Carolina. The settlers, angered by North Carolina's cession of their district to the Confederation, organized a government and elected John Sevier governor; North Carolina then revoked her cession, suppressed the 'State' of Franklin in 1788, and in 1789 again ceded what is now Tennessee to the general government. See TENNESSEE.

Franklin, Benjamin (1706-90), American statesman and author, was born in Boston, Jan. 17, 1706. In 1723 Benjamin ran away, going first to New York and thence to Philadelphia, where he shortly found work in the printing-office of Samuel Keimer. His abilities attracted the attention of the governor of Pennsylvania, Sir William Keith, who urged him to set up an office for himself. Franklin went to London to buy type and supplies, only to find on arrival that the promised support was not forthcoming, and that he himself was penniless in a strange land. He worked at his trade in London until the summer of 1726, when he returned to Philadelphia. There he shortly established a printing-office of his own.

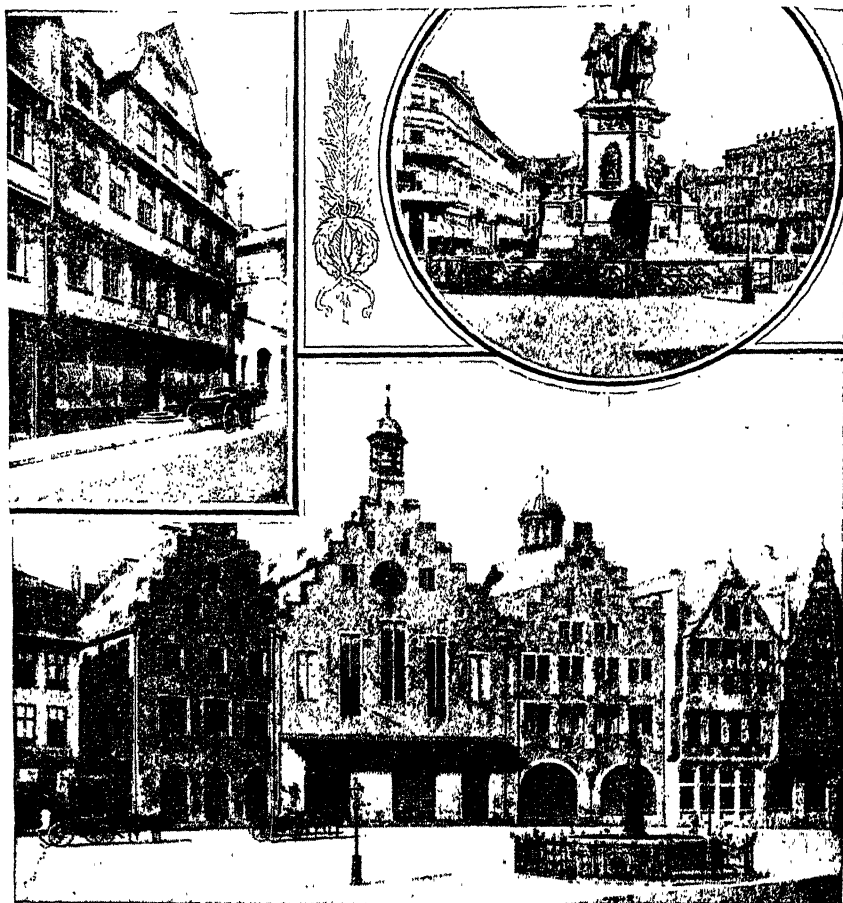
The excellence of his work, his industry, and his business shrewdness presently obtained for him a large share of the public printing of Pennsylvania, Delaware, and New Jersey. In 1728 he established the *Pennsylvania Gazette*, which became the leading newspaper between New York and Charleston, and of which he retained the ownership until 1748. A pamphlet entitled 'A Modest Inquiry into the Nature and Necessity of a Paper Currency,' published

in 1729, though specious in argument, did much to induce the adoption of paper currency in the province, and secured for Franklin the printing of the money first issued. In 1732, he began the publication of *Poor Richard's Almanac*, which for twenty-five years held its place as the most notable compilation of the kind in the English language. He was one of the organizers, in 1730, of the first Masonic society in America, being himself elected grand master in 1734. In 1730 he married Deborah Read, of Philadelphia, who died in 1774.

His active political life began in 1736, when he was chosen clerk of the General Assembly of Pennsylvania, an office which he retained by successive elections until 1750, when he became a member of the Assembly. In 1737 he was made postmaster of Philadelphia. The Franklin stove, or 'Pennsylvania fireplace,' was perfected in 1742. During King George's War (1741-1748), he was active in providing for the defence of the colony against the French and Indians. In 1753 he was made one of the two deputy postmasters-general for North America, an office which he filled until 1774. His experiments with electricity, to which subject his attention first became directed about 1746, won him the rare honor of membership in the Royal Society.

At the colonial congress at Albany, in 1754, Franklin, who was a member from Pennsylvania, submitted a plan of colonial union. The plan was adopted by the congress, but rejected by the colonial assemblies and not considered by the crown. During the French and Indian War which followed (1754-1761) Franklin took a prominent part in directing the defence of Pennsylvania.

It was at this time that the bitter struggle between the people of Pennsylvania and the Penn family, the proprietaries of the colony, over the taxation of the proprietary lands, became acute. In 1757 the Assembly of the province sent Franklin, who had been the most prominent opponent of the proprietary claims, to England to lay the case before Parliament. In 1759 he published in London *An Historical Review of the Constitution and Government of Pennsylvania*. After more than three years of argument and delay, the controversy ended in a substantial victory for the province. Franklin did not return to Pennsylvania until late in 1762. On his return to Philadelphia he was received with marked honor, in addition to an election, in advance of his arrival, to a seat in the Assembly. His natural son, William, was appointed governor of New Jersey. A period of great public activity for Franklin



Views in Frankfort-on-the-Main.

Upper Left, Goethe's House; Upper Right, The Gutenberg Monument; Lower, The Romer.

now begins. In 1763 he inspected the postal service throughout the colonies, travelling 1,600 m. in the course of the year. In the election of members of the Assembly, October, 1764, he was defeated; but he was shortly chosen agent to present to the crown the petition of the colony for a change of government. He reached London in December, to find Parliament, under the lead of Grenville and Charles Townshend, about to accept the Stamp Act. A resolution against the proposed act had been passed by the Pennsylvania Assembly before Franklin left; and he now remonstrated against the act. The remonstrance was useless, and on March 22d the Stamp Act received the royal assent by commission.

Franklin, at the request of Grenville suggested his friend John Hughes as stamp distributor for Pennsylvania. The recommendation was one of the few political blunders of Franklin's long career, and was later the occasion of bitter denunciation on the part of his enemies. But the forcible nullification of the Stamp Act by the colonists soon undeceived both Franklin and the ministry. In February, 1766, he was examined at the bar of the House of Commons in regard to the situation in America; and his bold and adroit answers, shortly published, made a deep impression.

In 1768 he was appointed colonial agent for Georgia, in 1769 for New Jersey, and in 1770 for Massachusetts. In 1772 several letters

written by Governor Thomas Hutchinson, of Massachusetts, and others to William Whately, a member of Parliament and under-secretary of state, and containing expressions reflecting on the motives and course of the patriot leaders and urging the need of stronger royal control, fell into Franklin's hands. Franklin sent the letters to Thomas Cushing, speaker of the Massachusetts House of Representatives, but without giving direct permission to publish them. The letters were, of course, promptly printed, and greatly intensified the popular bitterness against the crown officers in the colony. When the letters appeared in England, a storm of denunciation burst upon Franklin. At an inquiry into the matter before the Lords of Trade, in January, 1774, Franklin was abusively denounced by Wedderburn, the solicitor-general, and was shortly removed from his office of deputy postmaster-general for North America. He continued to act as agent, and in December, 1774, with Arthur Lee and William Bolla, representing Massachusetts, presented to Lord Dartmouth the declaration of rights and the petition to the king adopted by the first Continental Congress. His popularity had been shattered, however, and this, together with the decision of the ministry to compel the obedience of the colonies, terminated his usefulness for the time being. In March, 1775, he sailed for America, destroying with his departure the last hope of reconciliation between the colonies and the mother country.

Before he reached Philadelphia, the Revolutionary War had begun, and the day after his arrival he was chosen a delegate to the second Continental Congress. He drew up the first plan of union laid before Congress; organized the postal system, himself holding the office of postmaster-general and served on the committee to confer with Washington at Cambridge. He was at the same time chairman of the Pennsylvania Committee of Safety; served for a time as member of the Assembly; and in 1776 was president of the constitutional convention of the State. He was also a member of the committee which drafted the Declaration of Independence. When Lord Howe, in the summer of 1776, undertook to treat with Congress for reconciliation, Franklin served as one of the commissioners with whom Howe vainly discussed the matter. In September he was chosen envoy to France, to act in co-operation with Arthur Lee and Silas Deane.

On his arrival in France, Franklin was welcomed with enthusiasm. His great skill as a negotiator and immense personal popularity,

re-enforced by the then hereditary antipathy of the French and English people for each other, conspired to favor the purpose of his mission. A treaty of alliance with the United States was signed by the French king on Feb. 6, 1778. With John Adams and John Jay he concluded with Great Britain the provisional treaty of peace of Nov. 30, 1782, which was superseded by the definitive treaty, in the same terms, of Sept. 3, 1783. He continued to discharge the duties of minister plenipotentiary at Paris until 1785, when, in consequence of advanced age and increasing infirmities, he was relieved at his own request.

On his arrival at Philadelphia, in September, he was elected president of the Council of the State, an office which he held for three years. The presidency of the trustees of the University of Pennsylvania was also conferred upon him. He was not among the first representatives of Pennsylvania in the Federal Convention of 1787, which framed the Constitution, but was shortly chosen to a seat in order that, in case of the absence of Washington, 'there might be some one whom all could agree in calling to the chair.' His last public act was the signing of an anti-slavery petition to Congress as president of the Pennsylvania Society for Promoting the Abolition of Slavery.

Franklin died in his eighty-fourth year, on April 17, 1790. A great multitude followed his body to its final resting place in Christ Church Cemetery, Philadelphia. Congress voted to 'wear the customary badge of mourning for one month'; and Mirabeau pronounced in the National Assembly of France an eloquent eulogy upon him.

Franklin's writings continue to this day to be republished in almost every written tongue. His complete writings, which have been edited by John Bigelow, Jared Sparks, and A. H. Smyth, consist almost exclusively of letters addressed to private individuals, very few of which were given to the press in his lifetime. Even his scientific discoveries were communicated to the world in letters to personal friends. The very interesting *Autobiography* was specially edited by Bigelow. Consult the *Lives* by Sparks, J. Parton, and J. T. Morse, Jr.; J. B. McMaster's *Benjamin Franklin as a Man of Letters*; P. L. Ford's *The Many-Sided Franklin*; S. G. Fisher's *The True Benjamin Franklin*; E. E. Hale and E. E. Hale Jr.'s *Franklin in France*; MacDonald's *Some Account of Franklin's Later Life* (1905); Eliot's *Four American Leaders* (1906); Pepper's *The Medical Side of Benjamin Franklin* (1911).

Franklin, Sir John (1786-1847), English

Arctic explorer, was born in Spilsby, Lincolnshire. He occupied the post of signal midshipman on the *Bellerophon* in the Battle of Trafalgar, and in 1814 distinguished himself in the attack on New Orleans, receiving a slight wound in the hand-to-hand combat. In 1818 he was appointed to the *Trent*, as second to Captain Buchan on the *Dorothea*, in the expedition sent by way of Spitzbergen. In the following year he led an expedition proceeding from York Factory through Rupert's Land, which descended the Coppermine River, and traversed 5,550 m. by land and water. In a second expedition (1825-7) he descended the Mackenzie River, and traced the coast thence through 37° to near the 150th meridian. He accompanied various exploring expeditions and in recognition of his achievements he was knighted (1829).

In 1845 Franklin was appointed to the command of an expedition for the discovery of the Northwest Passage. The expedition, consisting of the *Erebus* and *Terror*, with 134 chosen officers and men, sailed from Greenhithe on May 19, 1845, and was last seen on July 26 following by a whaler in Baffin Bay. In 1878-80 the expedition of Lieutenant Schwatka of the U. S. army found the skeletons and other relics of Franklin's men. See ANTARCTIC EXPLORATION. Consult M'Clintock's *Narrative of the Fate of Sir John Franklin*; *Life* by H. D. Traill.

Franklin, Samuel Rhoads (1825-1909), American naval officer, was born in York, Pa. He played a conspicuous part in the naval operations and actions of the Mexican and Civil Wars, and was successively superintendent of the U. S. Naval Observatory and commander-in-chief of the European station. He wrote *Memories of a Rear-Admiral*.

Franklin, Sydney (1903-), bull fighter, was born in Brooklyn, N. Y., and was educated at Columbia University. He began to study art, but became interested in bull fighting when he saw an exhibition in 1922. He entered the arena in Mexico and trained under Gaona. He made his first professional appearance in 1923, and has fought in over 200 bull fights. He made his debut in Spain, 1929, after becoming the idol of Mexico. The only American bull fighter in the world.

Franklin, William (1729-1813), Colonial governor of New Jersey, the natural son of Benjamin Franklin, was born in Philadelphia. He studied law in London, England, was called to the bar, and was made by Lord Fairfax governor of New Jersey (1762). During the Revolution some of his captured correspond-

ence revealed such strong loyalist sentiments that he was declared an enemy and put under guard. After living in New York for four years he went to England, where he resided until his death, supported by a royal pension.

Franklin, William Buel (1823-1903), American soldier, was born in York, Pa. He fought at the Battle of Bull Run (July, 1861) as brigadier-general of volunteers, and in nearly all the battles of the Peninsular Campaign. In July, 1862, he was made a major-general and commander of the Sixth Corps, Army of the Potomac; and in December, 1862, commanded the left grand division at the Battle of Fredericksburg. He resigned from the service in 1866, and became vice-president of the Colts Firearms Co., president of a commission for laying out Long Island City (1871-2), and held various other posts of importance, including that of U. S. Commissioner for the Paris Exposition of 1889.

Franklin and Marshall College, an institution of learning at Lancaster, Pa., founded in 1853 by the consolidation of Franklin College, at Lancaster, founded 1787, and Marshall College, at Mercersburg, founded 1836. The College is under the supervision of the Reformed Church.

Franklin College, a co-educational institution founded by the Baptist denomination at Franklin, Ind., in 1834.

Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts, an organization founded in 1824. The purpose of the founders, set forth in the corporate title, is carried out through lectures, schools, exhibitions, monthly meetings, and a large scientific and technical library. It has a committee on science and the arts who examine and report upon inventions, and have authority to award premiums and medals for discoveries and inventions of conspicuous merit.

Frank-marriage. Under the common law of England, a special fee tail estate created by the conveyance of lands to the bridegroom of a female relative of the donor with a limitation to the issue of the marriage. It does not exist in the United States.

Frank-pledge. After the first series of Danish invasions (855-89) measures were taken by the English for preserving order. In many parts of England a number of men would form an association, the members of which were bound to do their utmost to bring to justice any one of their body who broke the peace. The Normans adopted this system, called it frank-pledge, and made it more severe.

Franks, The, a confederation of tribes who are found about 250 A.D. settled in the lower Rhine valley, and grouped shortly afterwards as Salian Franks, on the lower Rhine, and Riparian Franks, on the middle Rhine. After the accession of Clovis, in 481, to the throne of the Salian Franks, the dependence upon Rome, which had lasted since the early part of the 5th century, came to an end. Clovis, having occupied the Seine valley, overthrew (496) the Alemanni, and then became an orthodox Christian. This induced the church to throw all its influence on the side of the Salian Franks, who by 510 had conquered or absorbed all the other Frankish tribes. The next epoch in the history of the Franks was marked by their division (567) into the Austrasian and Neustrian Franks, their struggle for supremacy, and their final separation. The battle of Testry in 687 established the victory of the eastern over the western division, and was the deathblow of the Merovingian dynasty. The rise of the Carolingians led to the formation of the empire of Charles the Great; but on his death quarrels ensued among his descendants, and finally, by the treaty of Verdun (843), the empire was dismembered. Three monarchies then arose, one of which was that of Germany, another that of France, and the third that of Burgundy and Lorraine. See L. Sergeant's *The Franks* (1898); also FRANCE.

Franz Josef Land, archipelago of some sixty islands, situated about 250 m. to the e. of Spitzbergen. Nearly the whole group is covered with snow-clad glaciers. Franz Josef Land was discovered in 1873 by Payer and Weyprecht. Later explorers have shown that much of what was then believed to be continuous land is broken up into islands. Here in 1896 (June 17) occurred the dramatic meeting with Nansen and Johansen, who had spent the previous year in the northern part of the archipelago. See Jackson's *A Thousand Days in the Arctic* (1899); Payer's *New Lands within the Arctic Circle* (1876). Leigh Smith's two voyages are described by Sir Clements Markham (*Proc. Roy. Geog. Soc.*; iii.), and Nansen's observations are recorded in vol. ii. of his *Farthest North* (1897).

Franzos, Karl Emil (1848-1904), German novelist, born in Podolia, Russia, son of a Jewish doctor. He wrote numerous novels, in many of which he depicts with great power and brilliant coloring the varied types of men in his old home and the strange charm of its scenery, particularly in *Aus Halb-Asien* (9 vols. 1876-90) and in his very remarkable novel, *Ein Kampf ums Recht* (1882).

Frascati, town, episcopal see, and summer resort of Italy, province Rome. It represents the ancient Tusculum, and possesses several handsome villas—Torlonia (Conti), Aldobrandini, and Ruffinella. It is famous for its gardens and its wine; p. 12,000.

Fraser, river, British Columbia, formed by the union of the South Fork and the North Fork. The river is navigable for steamboats as far as Yale (190 m.). The salmon canneries of the river are exceedingly important. The river is so called from Simon Fraser, who explored it in 1808. Area of basin, 138,000 sq. m.

Fraser, Alexander Campbell (1819-1914), Scottish philosopher, born at Ardchattan, Argyllshire. In 1856 he succeeded Sir W. Hamilton in the chair of logic and metaphysics in Edinburgh University, from which he retired in 1891. His editions of Locke and Berkeley are standard works.

Fraser, Charles (1782-1860), American artist, was born in Charleston, S. C. He practised law until 1818, when, having gained a competence, he retired and devoted himself to art. Between 1818 and 1860 he painted the portraits of most of the prominent persons of the United States. His *Reminiscences of Charleston* appeared in 1854.

Fraser, John Foster (1868-1936), British writer, born Edinburgh. He became a journalist, and wrote descriptive sketches of proceedings in the British House of Commons. Subsequently he made a bicycle trip around the world, covering 19,237 m. in 774 days, of which he has written an account in his *Round the World on a Wheel*.

Fraserburgh, seaport, Aberdeenshire, Scotland, on the southern slope of Kinnaird's Head; 47 m. n.e. of Aberdeen. It is the chief center of the Scottish herring fishery. The town was formerly called Faithlie or Philorth; p. 12,500.

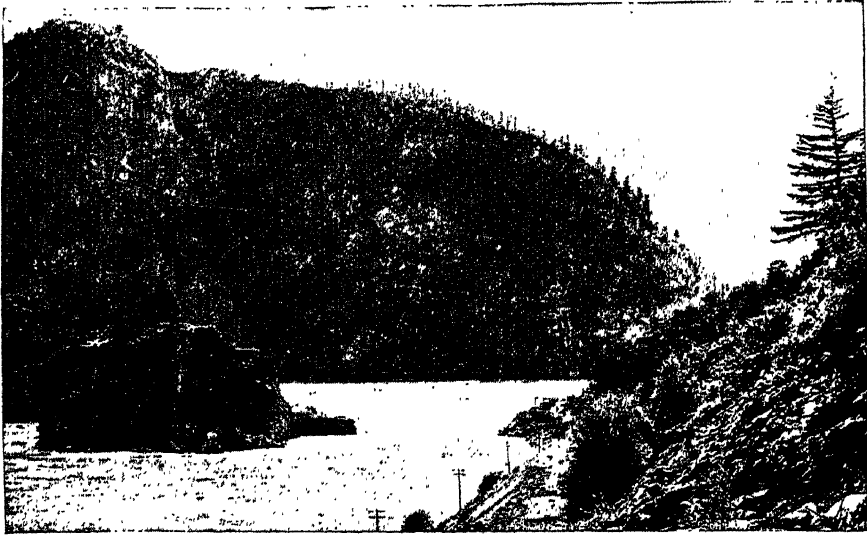
Fraternal Insurance, an agreement whereby a fraternal beneficiary society pays to its members or to their beneficiaries, as prescribed in its constitution and laws, death or other benefits in return for stated annual or monthly premiums. Fraternal insurance differs from old-line insurance (see INSURANCE) chiefly in being an obligation to pay under stipulated conditions, rather than a contract for indemnity against loss. Owing to the mutual character of fraternal organizations and their lack of soliciting agents, their rates are comparatively low.

In recent years the natural premium system, based upon attained age, and making the payment of each cover the year's risk, has been adopted by many societies. Variations of this

are the step-rate plan peculiar to fraternal insurance, whereby the rates are increased at five-year intervals; and several modifications involving higher rates in youth to counteract insufficient later rates. The reserve is limited to one year, and is supplied by making premiums payable in advance.

The most influential agent in procuring these reforms has been the National Fraternal Congress, organized in 1886 primarily for the purpose of establishing uniform minimum rates throughout the United States. Voluntary agreement on the part of the various orders proving impossible, and existing legislation

organized on the lodge system, with ritualistic ceremonies, for the advantage of members and their beneficiaries. Their usual foundation is a contract to pay, by means of assessments, a stipulated amount of insurance to the beneficiaries of deceased members, and in many instances sick, disability, or other benefits. They are not conducted for profit, and have no capital stock. The general aim of these societies is to cultivate a spirit of fraternity. The government is carried on by representatives from the local branches, and the constitution and by-laws of each society are determined by the members. To some, men alone



Lower Fraser Cañon and Franklin Rock, near Yale, B. C.

being inadequate, a bill was draughted in 1910 for introduction into the State legislatures. This bill provided in part for sufficient rates based on sound mortality tables, and stipulated that societies found insolvent by their annual reports should be readjusted according to certain regulations. Laws have been passed in about thirty States containing the chief articles of the bill, and embodying the provision that future rates shall be calculated from mortality tables at least equal to those of the National Fraternal Congress. See *INSURANCE*. Consult Landis' *Life Insurance Problems* (1910); Anderson's *Valuation and Readjustment of Assessment Companies and Fraternal Societies* (1913).

Fraternal Societies, in the United States, are corporations or voluntary associations or-

are eligible; some have attached organizations to which only women relatives are eligible; others admit both men and women; and a few are for women only. The fraternal beneficiary societies of the United States are the outgrowth of the friendly societies of England, and have the same basis and fundamental principles, although they possess features which are distinctly American.

As early as 1730 the Masonic Order was introduced into Pennsylvania, and in 1735 there were lodges in half a dozen of the leading cities of America. In 1819 the Order of Odd Fellows found its way to the United States; in 1836, the Ancient Order of Foresters and the Ancient Order of Hibernians; in 1839, the Ancient Order of Druids. Following these came the Sons of Hermann in 1840, and the German

Order of Harugari in 1847, which also adopted friendly society features. The Actors' Order of Friendship, organized in 1849, was the first distinctly American fraternal society, although the Improved Order of Red Men formed in 1834, afterward developed beneficiary features.

At the beginning, no attention was paid to the need of creating a reserve fund to meet the increasing demands of an aging membership. In recent years, however, the larger and better known societies have had the wisdom to increase their rates of assessment, graded according to age, and to provide for a reserve against the evil hour of epidemic, disaster, and the draught of a heavily increased membership of advanced age.

In 1886 the National Fraternal Congress was organized by a number of the older and larger fraternal societies, with the aim of securing uniform laws in the United States and Canada. Accordingly, in 1900-or a bill was suggested by the Congress to the legislatures of several States, but the bill was everywhere defeated. In 1901 a second joint association of fraternal societies, the Associated Fraternities of America, was organized for the purpose of opposing further legislation until public opinion should be so modified as to permit the fullest possible freedom to the societies in their adoption of adequate rates. In 1912 the two associations were united, and co-operated in support of the Mobile Bill, a measure providing for the valuation of beneficiary societies and the increase of assessments sufficient to make them legally solvent.

The organization of fraternal societies, based on the principle of representative government, includes a supreme body elected by the local lodges or chapters, and local bodies enjoying immediate jurisdiction in their districts. Each society has its own constitution, by-laws, rules, and regulations, and it exercises without right of appeal both discretionary and punitive administration to its members. The executive head and other high officers are members of the supreme council. The supreme body pays permanent disability and death benefits, makes laws for the society as a whole, and in most cases elects officers. In some of the newer organizations the grand jurisdiction is omitted or replaced by election districts. The ritual, mottoes, symbols, and pass words of each society are withheld from non-members, constituting its secret element.

See **SECRET SOCIETIES**; also separate articles on the individual fraternal societies. Consult Anderson's *Valuation and Readjustment of As-*

essment Companies and Fraternal Societies (1913).

Fraternities, College, or Greek-Letter Societies, are social and literary organizations of students at American universities and colleges. The titles of nearly all these societies are Greek letters, which usually refer to mottoes or watchwords; and these, with the accompanying grips and words, constitute the leading secrets imparted to novitiates.

The first society of American origin with a Greek-letter name was Phi Beta Kappa, which was founded on Dec. 5, 1776, at the College of William and Mary, in Virginia. Phi Beta Kappa was a secret society, and its objects were social enjoyment and the cultivation of literature. A chapter was established at Yale in 1780, and another at Harvard in 1781. When the approach of a British fleet caused the suspension of William and Mary in 1781, Phi Beta Kappa had enrolled fifty members, the most noted being John Marshall, who became Chief Justice of the United States, and Bushrod Washington, a nephew of George Washington. In 1787 Harvard and Yale chapters joined in establishing a chapter at Dartmouth. The next chapters chartered were those at Union in 1817; Bowdoin, 1825; Brown, 1830; Trinity, 1845; and Wesleyan, 1845. The society was restored at William and Mary in 1849.

Owing to the prejudice against secret societies aroused by the anti-Masonic excitement which prevailed throughout the United States for a number of years, the secrets of Phi Beta Kappa were exposed to the public in 1831. After that time Phi Beta Kappa became merely an honorary college society, in which membership was conferred as a reward for scholarship.

Women were first admitted to Phi Beta Kappa in 1875. In 1883 a national organization of the chapters was effected by the adoption of a constitution for 'The United Chapters of the Phi Beta Kappa Society.' There are now chapters in seventy-eight institutions. In 1898 a charter was granted for a chapter at Vassar, and since then chapters have been established at several other colleges for women.

The establishment of Phi Beta Kappa at Union in 1817 led to the organization there of Kappa Alpha in 1825, and within two years two other Greek-letter societies were established there, Sigma Phi and Delta Phi. Of the older organizations, Alpha Delta Phi, Psi Upsilon, and Delta Kappa Epsilon are the historic three which have faced each other at leading older colleges, and they rank as leaders to-day. Kappa Alpha, Sigma Phi, Delta Phi, and Delta

Psi have ever clung to few chapters, small membership, and social exclusiveness. Delta Kappa Epsilon, Phi Delta Theta, and Beta Theta Pi have extended the most and have the largest lists of members.

At present, fraternities thrive at all prominent institutions in the United States except at Princeton, Oberlin, and South Carolina, where they are still prohibited. No college fraternities are found outside the United States and Canada.

The founders of Phi Beta Kappa wrought out the essential features of the modern Greek-letter fraternity, and so incorporated them in laws and traditions as to influence strongly college fraternity customs in subsequent years. These features included a secret social organization, with a name of Greek letters; the letters were the initials of a secret motto, which briefly expressed the aims of the society. The members magnified the word 'fraternity' and the bond of brotherhood. Phi Beta Kappa had a constitution, a form of initiation with its 'oath of fidelity,' secret signs of salutation and recognition, a secret grip, a cipher, a badge, a seal, and society colors. The founders held regular meetings for social, literary, and business purposes. At the meetings there were literary exercises, and in this Phi Beta Kappa set an example which was followed for years by modern fraternities, some chapters of which continue to have such exercises.

Each fraternity, when it had established several chapters, began to hold conventions, composed of delegates from the chapters. The fraternities are now strongly organized, and the general officers exercise efficient supervision over the chapters. The Inter-Fraternity Conference of representatives of the general fraternities for men has met annually since 1909 to discuss questions of common interest. All of the fraternities have alumni clubs in the larger cities.

In the early days the chapters met in rented halls. As the fraternities became stronger they began to erect houses. Many of the chapter houses have been built at great expense. The finest are at Williams, Columbia, Cornell, Michigan, and Wisconsin.

Kappa Alpha followed Phi Beta Kappa in adopting a square badge, but it was suspended from the corner instead of from one side. Later the badges of both were changed to the form of a watch key. The badges of other fraternities are usually of three general shapes—a lozenge, various forms of crosses, and various shapes of shields.

Most fraternities have journals, which are

published quarterly, monthly, or bi-monthly during the collegiate year. All fraternities have issued books, which in some cases have run into many editions.

There are now many professional fraternities for students in the law, medical, scientific, dental, pharmaceutical, and agricultural departments of universities. Among the better known of these are: Delta Chi, law, organized 1899 at Cornell; Nu Sigma Nu, medicine, organized 1882 at the University of Michigan; Phi Delta Phi, law, organized 1860 at the University of Michigan; Theta Xi, science, organized 1864 at Rensselaer Polytechnic Institute.

There are also many intercollegiate fraternities for women—or sororities, as they are usually called. All of these have Greek-letter names, and in organization are similar to the general fraternities for men. The first of them—Kappa Alpha Theta and Kappa Kappa Gamma—were founded in 1870.

Local fraternities are to be found in many universities, notably at Yale, where the secret society system differs from that of almost every other institution, with local fraternities for seniors—Skull and Bones (1832), Scroll and Key (1841), Wolf's Head (1884), Elihu Club (1906); also five general fraternities which have chapters at many other universities where there are four-year societies, as the junior year stepping stones to 'Bones,' 'Keys,' Wolf's Head, and *Elihu*.

The legal status of fraternities has been the subject of at least two court decisions. In a case affecting Purdue University, the supreme court of Indiana in 1881 admitted the right of privately endowed institutions to exclude fraternity members, but denied the right to institutions receiving State aid. In 1909 the supreme court of New York decided that a chapter may not be deprived of its charter unless it has violated a rule of the fraternity.

Exhaustive information concerning fraternities, with a sketch of each, may be found in *Baird's Manual of American College Fraternities*; similar information concerning sororities in *Ida S. Martin's Sorority Handbook*. Consult also *Stevens' Cyclopædia of Fraternities*; *Downs' American College Fraternities*.

Fraticelli ('little brethren'), a sect of the Middle Ages which may be regarded as an embodiment, outside of the mediæval church, of the same spirit to which is due, within the church, the Franciscan order with its many offshoots. The Italian word *Fraticelli* originally was the popular name of the Franciscan monks; but in the progress of the disputes that arose in the order (see **FRANCISCANS**), the

name was specially attached to the members of the rigorist party, who eventually refused to accept the pontifical explanations of the monastic rule, and in the end threw off all subjection to the authority of the church.

Fraud, in law, signifies any dishonest means employed for the purpose of injuring another or otherwise affecting an illegal design. For example, if a person knowingly makes a false statement or represents himself to be other than he really is, thereby causing another to contract with him, or takes advantage of the youth or defective mental capacity or intoxicated condition of another, he is obviously guilty of fraud. So, also, if an insolvent contrives to give one of his creditors an advantage over the rest, or if a husband and wife resort to collusive means of obtaining a divorce. It will thus be seen that fraud is a necessary element in a number of crimes and civil wrongs. (See DECEIT.)

A party is entitled to set aside a contract into which he may have been induced to enter through another's fraud. (See EQUITY; CONCEALMENT.)

Statute of Frauds.—The title originally given to an English statute of 1677 (29 Car. ii., c. 3), sections 4 and 17 of which have either been re-enacted or substantially followed in all of the United States. Therefore a person speaking of the Statute of Frauds usually refers to the statute in his own State containing similar provisions to the above. See CONTRACT.

Fraunhofer, Joseph von (1787-1826), German optician, was born in Straubing, Bavaria. His more important inventions include a spherometer, a heliometer, a micrometer, an achromatic microscope, and the great parallax telescope at Dorpat. He also effected improvements in the quality of telescopic prisms, and in the mechanism for manipulating telescopes of large size; and discovered the dark lines in the sun's spectrum, which bear the name of Fraunhofer lines.

Fraunhofer Lines, dark lines in the solar spectrum, partially observed by Wollaston in 1802, and mapped in 1814 by Joseph von Fraunhofer. Their meaning remained mysterious until the discovery, by Kirchhoff and Bunsen, in 1859, of the principles of spectrum analysis. (See SPECTRUM.) The best modern maps of the solar spectrum, executed photographically by Prof. Henry A. Rowland of Johns Hopkins University, include more than 10,000 Fraunhofer lines.

Frayser's (Frazier's) Farm, Battle of, also known as the BATTLE OF GLENDALE, one of the Seven Days' Battles, was fought on

June 30, 1862, about 12 m. s.e. of Richmond, Va., between the Federal Army under McClellan and the Confederate Army under Lee. The day was probably the most critical one during McClellan's change of base, and Lee lost his last real chance during the Peninsula Campaign to crush the Federal Army. See PENINSULA CAMPAIGN.

Frazer, John (1790-1852), American sculptor, was born in Rahway, N. J. In 1834 he executed busts of Daniel Webster, Prescott, Lowell, Story, and others for the library of Boston Athenæum, and afterward produced busts of Lafayette, De Witt Clinton, and General Jackson. He was one of the first Americans to give serious attention to the sculptural art.

Frazer, John Fries (1812-72), American scientist, was born in Philadelphia, Pa., and was professor of chemistry and natural philosophy in the University of Pennsylvania. He determined with accuracy the diurnal variations of the magnetic needle, and showed the connection between the aurora borealis and magnetism.

Frazer, Sir James George (1854-1941), Scottish author, was born at Glasgow. His works are mostly on mythology, the chief one being *The Golden Bough*, 12 vols. (1890-1915), which deals with comparative religion. Other works are *Totemism and Exogamy* (1910); *Folk-lore in the Old Testament* (1923); *Myths of the Origin of Fire* (1930).

Frazer, Persifor (1844-1909), American geologist, was born in Philadelphia. He was professor of chemistry at the University of Pennsylvania and the first foreigner to receive the doctorate of natural science from the University of France. He was the author of *Tables for the Determination of Minerals*, and of more than 300 papers and articles in scientific journals.

Frazer Island, or Great Sandy Island, Queensland, Australia, between Wide Bay and Hervey Bay. It is about 65 m. long by 10 wide.

Frear, Walter Francis (1863), American public official, was born in Grass Valley, Cal. In 1893 he became second associate justice of the supreme court of Hawaii; in 1896 first associated justice; and in 1900 chief justice. In 1907 he was appointed governor of Hawaii Territory.

Fréchette, Louis Honoré (1839-1908), French-Canadian poet, was born in Levis, Quebec. His most important productions were several volumes of poems, two of which were crowned by the French Academy in 1880. His volumes of verse include: *Mes Loisirs* (1863);

La Voix d'un Exile (1869); *Les Feuilles Volantes* (1891); *Veronica*, a drama in five acts.

Freckles (sometimes called *Lentigo*) are small yellowish or brownish-yellow, irregularly rounded spots, from the size of a pin's head to that of a split pea, frequently seen on the skin, especially of fair or reddish-haired persons. They are due to increased local deposit of pigment in the skin.

Frederic, Harold (1856-98), American novelist and journalist, was born in Utica, N. Y. He was editor of the *Albany Evening Journal* from 1882 to 1884, and then went to London and acted as correspondent for the *New York Times* from 1884 until his death. His novels include *Seth's Brother's Wife* (1887), *The Copperhead* (1894), and *The Damnation of Theron Ware* (1896), *Marsena* (1895), *March Hares* (1896), and *The Market Place* (1899).

Frederick, city, Maryland, county seat of Frederick co. It is the seat of the Woman's College and of the Maryland Institution for the Education of the Deaf. Frederick was founded in 1745. It was the place of residence and burial of Francis Scott Key, author of the 'Star-Spangled Banner.' It was also the place of residence of Barbara Fritchie, the heroine of Whittier's poem; p. 15,802.

Frederick I. (1123-90), Holy Roman emperor, the first of the Hohenstaufen dynasty, known as 'Barbarossa,' succeeded Conrad III. as emperor in 1152. His reign was one continuous struggle against refractory and powerful vassals at home, and against the turbulent civic republics of Lombardy and the pope in Italy. Frederick was at length reconciled with the papacy, and in 1183 the peace of Constance closed the struggle with the Lombard League. Frederick broke the power of Henry the Lion, Duke of Saxony, and divided the duchy; and in 1183, by the treaty of Augsburg, he arranged a marriage between his son Henry and Constance, daughter of Roger, king of Sicily. From this marriage sprang the union of Sicily with the empire. At the same time, owing to internal divisions, the Lombard League weakened, and Frederick's power in Italy revived. Being practically master of Germany and Italy, Frederick put himself at the head of the third crusade, but was drowned in a small stream in Cilicia. See Testa's *History of the War of Frederick I. against the Communes of Lombardy* (1877); and Tout's *The Empire and the Papacy* (1903).

Frederick II. (1194-1250), Holy Roman emperor, the son of the Emperor Henry VI. and of Constance, heiress of Sicily, was born at Jesi, near Ancona, in Italy, was elected

emperor in 1212, but was not crowned until 1215. In 1226 Frederick renewed the ancient imperial claims over Lombardy. Pope Honorius III. prepared to support the Lombard cities, and his successor, Gregory IX., began the celebrated struggle between the papacy and the emperor. In the ensuing struggle with the papacy, Frederick neglected his duties in Germany, and devoted all his energies to establishing in his Sicilian kingdom 'a centralized bureaucracy, dependent upon himself.' Aided by the Lombard cities and by many German nobles, the papacy eventually won the day. See Kington's *History of Frederick II.* (1862); and Tout's *The Empire and the Papacy* (1903).

Frederick III. (1415-93), Holy Roman emperor, was born at Innsbruck, in Tyrol, being a member of the house of Hapsburg; was chosen emperor in 1440. His reign covered a difficult period, during which the Turks invaded Hungary and Italy, and the Hungarians occupied Vienna. Switzerland escaped from his control, and Sforza took Milan. But he duped Charles the Bold, who wished to secure the royal title; he defeated the schemes of his opponents in Germany; and he gradually reunited the family territories of the Hapsburgs. From this time, indeed, the imperial dignity was almost hereditary in the house of Austria, Hapsburg. See Chmel's *Geschichte Kaiser Friedrichs IV.* (III.) (1840-3).

Frederick I. (1369-1428), elector of Saxony, was born at Altenburg, being the son of Frederick, margrave of Meissen; became involved in disputes with his two brothers, with the result that the family territory was divided. He fought against the Lithuanians, the Hungarians, the Emperor Wenceslaus, and the Hussites. But was disastrously defeated by the Hussites at Aussig in 1426.

Frederick III. (1463-1525), called 'the Wise,' elector and duke of Saxony, was born at Torgau, and succeeded his father in 1486. Wielding immense influence in German politics in the early years of the 16th century, Frederick of Saxony was a man of strong religious opinions; he was offered the imperial crown in 1519 on the death of Maximilian I. He, however, threw all his influence on the side of Charles of Spain, who became emperor as Charles V.

Frederick I. (1657-1713), king of Prussia, succeeded his father in 1688. He warmly supported the League of Augsburg and aided William III. in carrying out the revolution of 1688 in England. In order to secure Frederick's adhesion to the Austrian cause in the War of the Spanish Succession, the Emperor

Leopold gave him the title of king of Prussia (1701). He was elected prince of Neuchâtel, 1707. See Tuttle's *History of Prussia*, and Henderson's *Short History of Germany*.

Frederick II. (1712-86) king of Prussia, called 'the Great,' was born in Berlin; succeeded his father, Frederick William I., in 1740. Frederick revived an obsolete claim to part of Silesia, invaded the province, and defeated the Austrian army at Mollwitz, April 10, 1741, and Chotusitz, May 17, 1742. Austria, however, gained such conspicuous successes in the next two years that Frederick renewed his alliance with France, and re-entered the war in August, 1744, by invading Bohemia. His



Frederick the Great.

intervention forced the Austrian army to evacuate Alsace, but Frederick himself was driven from Bohemia, and in the next year was compelled to resist an invasion of Silesia. This he succeeded in doing by a great victory at Hohenfriedberg (June 5, 1745); and following the Austrians to Bohemia, he again defeated them, at Sohr (September 20). Finally, by a successful attack upon Saxony, the ally of Austria, he was able to effect the cession of Silesia by the treaty of Dresden, December 25.

In 1756, when Austria found allies in France and Russia, Frederick threw down the glove by invading Saxony, and thus commenced the famous Seven Years' War. His forces were decimated in fearful battles, but when the

outlook was almost hopeless he was saved by the death of Elizabeth of Russia, and by the exhaustion of France. Austria alone was powerless to overcome Frederick, and the treaty of Hubertsburg in 1763 allowed the Prussian king to retain his dominions intact. During the years of peace that followed, Frederick devoted himself to the work of domestic government. His greatest achievement in this period was the dexterous if unprincipled management of the first partition of Poland, 1772, by which he acquired West Prussia. Frederick appreciated the greatness of Washington during the American Revolutionary War, and was one of the first rulers to conclude a commercial treaty with the United States. See Carlyle's *History of Frederick II.* (1858-65); Longman's *Frederick the Great and the Seven Years' War* (1881); and Reddaway's *Frederick the Great* (1904).

Frederick III. (1831-88), German emperor, was born at Potsdam, the only son of Emperor William I., and the husband of Victoria, Princess Royal of England, whom he married in 1858. As crown prince he took up an independent line in political matters, and opposed Bismarck's policy on various occasions. In the war with Austria, 1866, he commanded the second army of 115,000 men, and on the outbreak of the Franco-German War of 1870-1, the crown prince commanded 200,000 men. In 1878, during the illness of the Emperor William, he acted as provisional regent; and, on the death of his father, in March, 1888, he became emperor as Frederick III., but three months later died from a disease of the throat.

Frederick V. (1596-1632), Elector Palatine; succeeded his father in 1610, and married Elizabeth, daughter of James I. of England, in 1613. When, in 1618, the Bohemians deposed the Emperor Ferdinand II., and chose Frederick as their king, a struggle, half political and half religious, began in Bohemia. Driven from Bohemia after his defeat at White Hill, 1620, Frederick found that the Palatinate was overrun by the Imperialists, and given to Maximilian of Bavaria, and Frederick was an exile for the rest of his life.

Frederick, seven kings of Denmark, of whom the following deserve notice. **FREDERICK III.** (1609-70), second son of Christian IV., succeeded his father in 1648; engaged in two ruinous wars with Sweden, 1658, which cost Denmark all her possessions in the Scandinavian peninsula. **FREDERICK IV.** (1671-1730), son of Christian V., whom he succeeded in 1699. He rebuilt Copenhagen, and relieved the wretched condition of the peasantry.~

FREDERICK V. (1723-66), son of Christian VI., whom he succeeded in 1746. He established trade with the American colonies.—**FREDERICK VI.** (1768-1839), son of the imbecile Christian VII., whom he succeeded in 1808, after acting as prince regent from 1784. His participation in the Napoleonic wars led to the bombardment of Copenhagen by the British, 1807, and ultimately the loss of Norway.—**FREDERICK VII.** (1808-63), son of Christian VIII., whom he succeeded in 1848. **FREDERICK VIII.** (1843-1912), was born at Copenhagen, on June 3, 1843, the eldest son of Christian IX., whom he succeeded in 1906; was popular with the people because of his democratic manners and his dislike of ostentation.

Frederick I. (1754-1816), king of Württemberg, was born at Treptow, in Pomerania, and succeeded his father in 1797. In 1805, on the outbreak of war between France and Austria, Frederick fought for the French, and was rewarded at the treaty of Pressburg by some Austrian lands in Swabia, together with the title of king. By joining the Confederation of the Rhine, the new king obtained fresh territories.

Frederick (1676-1751), king of Sweden, born at Kassel, third son of the landgrave Karl of Hesse-Kassel. His reign was distracted by the struggles of the Hats and the Caps parties.

Frederick Charles, of Prussia (1828-85), nephew of the Emperor William I., born at Berlin, was known as the 'Red Prince.' Served in the Schleswig-Holstein War (1848); in the Austrian War of 1866 he helped to win the battle of Sadowa; and in the Franco-German War of 1870-1 he gained distinction at Thionville, Gravelotte, and St. Privat. He also drove Bazaine into Metz, which he invested; and after its capitulation he took Orleans, and dispersed the army of the Loire.

Frederick Louis (1707-51), Prince of Wales, the eldest son of George II.; created Prince of Wales (1729), Frederick lived on bad terms with his father. The opposition to Walpole found Norfolk House, the prince's residence, a useful center; and round Frederick, in 1737, gathered Bolingbroke's followers.

Fredericksburg, city, Spottsylvania co., Va. The manufactures include paper, flour, leather, shoes, machinery, etc. It is the seat of Fredericksburg College. There is a monument in honor of Washington's mother, who died here; p. 10,066.

Fredericksburg, Battle of, a battle of the American Civil War fought at Fredericksburg, Va., on Dec. 13, 1862, between the Federal

Army of the Potomac (numbering about 113,000) under Gen. Burnside and the Confederate Army of Northern Virginia (numbering about 78,000) under Gen. Lee. The Federals lost about 12,600 men, the Confederates about 5,400. Burnside's attack has been regarded as one of the greatest mistakes made by any prominent officer on either side during the war, and its repulse was one of the most appalling disasters suffered by a Federal army. See Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (4 v. 1887); Henderson, *The Campaign of Fredericksburg*, Nov.-Dec., 1862 (1886).

Frederick William (1620-88), elector of Brandenburg, known as the 'Great Elector,' was born at Köln on the Spree, and succeeded his father in 1640. His internal reforms were noteworthy. Agriculture was encouraged, a canal made between the Elbe and the Oder, and after the revocation of the Edict of Nantes, 1685, over 20,000 Huguenots found a home in Brandenburg. See Tuttle's *History of Prussia*, 1134-1740 (1884).

Frederick William I. (1688-1740), king of Prussia, was born at Berlin, son of Frederick I., whom he succeeded in 1713. See Tuttle's *History of Prussia*, 1134-1740 (1884).

Frederick William III. (1770-1840), king of Prussia, son of Frederick William II., whom he succeeded in 1797. In 1806 he was overthrown by Napoleon and the treaty of Tilsit, 1807, completed the ruin of Prussia, which remained till 1813 dependent upon Napoleon. In 1813 Prussia definitely joined Russia in the war of liberation. Though defeated at Lützen and Bautzen, the allies, reinforced by Austria, overthrew Napoleon at Leipzig. At the Congress of Vienna Prussia regained her lost territory, with sundry additions. See Hahn's *Friedrich Wilhelm III. und Luise* (3d ed. 1877).

Fredericton, port of entry, N. B., Canada, capital of the province and of York co.; is the seat of the University of New Brunswick and of the Provincial Normal School. It has a large lumber trade, and manufactures of mill machinery, woodenware, and shoes, etc.; p. 8,114.

Frederikshald, town and seaport, county Smaalenene, Norway. Under its walls Charles XII. of Sweden was killed in 1718; p. 11,936.

Fredonia, Village, Chautauqua co., N. Y. There are two large canning factories and important grape industries, including the making of grape juice and wine. There are other nursery products, and grapes are shipped in great quantities in car loads. Among educational and philanthropic institutions are a

State Normal School, Old Ladies' Home, and the Barker Library; p. 5,738.

Freebench. Under the English common law, a form of dower by custom, not requiring assignment by the heir.

Free Church Federation. A federation of dissenting churches in England, dating from the year 1892. The most important religious bodies included in the federation are the Congregational, Presbyterian, Methodist, and Baptist Churches, the Free Episcopal Church of England, and the Society of Friends. The main objects of the federation are, to facilitate intercourse and co-operation among the members, to advocate the New Testament doctrine of the church, and to defend the rights of the associated churches.

Freedmen's Bureau, or Bureau of Refugees, Freedmen, and Abandoned Lands, a bureau of the U. S. War Department originally created by the Act of Mar. 3, 1865, to remain in existence for one year after the close of the Civil War. The establishment of such a bureau was rendered necessary by the presence within the Federal lines of vast numbers of negroes who had escaped or had been rescued from slavery, and who were dependent for support upon the Federal Government. The bureau was placed in 'control of all subjects relating to refugees and freedmen from rebel states,' and was authorized to assign from the confiscated or abandoned lands of these states forty acres to each male refugee or freedman, to whom possession was guaranteed for three years. The bureau withdrew from the various states on Jan. 1, 1869, except as regards its educational work, which was continued until 1870. Consult Pierce, *The Freedman's Bureau* (1904), and *Report of Joint Committee on Reconstruction* (1866).

Freedoms, The Four. Essential human freedoms proclaimed by President Roosevelt in his message to Congress Jan. 6, 1941: freedom of speech; religious freedom; freedom from want; freedom from fear.

Freehold, in the classification of estates in land, any estate of inheritance or for life, held by a free tenure.

Freehold, town, New Jersey, county seat of Monmouth co. The battle of Monmouth was fought here June 28, 1778.

Free Imperial City, was a city, within the territories of the former German empire, which held its rights and privileges direct from the emperor without intermediary. When their privileges were swept away in 1803, there were 14 Rhenish and 37 Swabian free cities.

Freeman, Douglas Southall (1886-

), American editor and author, was born in Lynchburg, Va.; was educated at Richmond College and Johns Hopkins. He wrote *R. E. Lee* (Pulitzer prize, 1934), *Lee's Lieutenants* (1942-43).

Freeman, James (1759-1835), American clergyman, was born at Charlestown, Mass. In 1782 he became lay-reader of King's Chapel, Boston, and, having adopted Unitarian views, persuaded the congregation to follow him, and he was consecrated by them minister of the church in 1787. King's Chapel thus became the first Unitarian church in America.

Freeman's Farm, Battle of, a name by which the first battle of Saratoga, Sept. 19, 1777, during the American Revolution, is sometimes known. See SARATOGA.

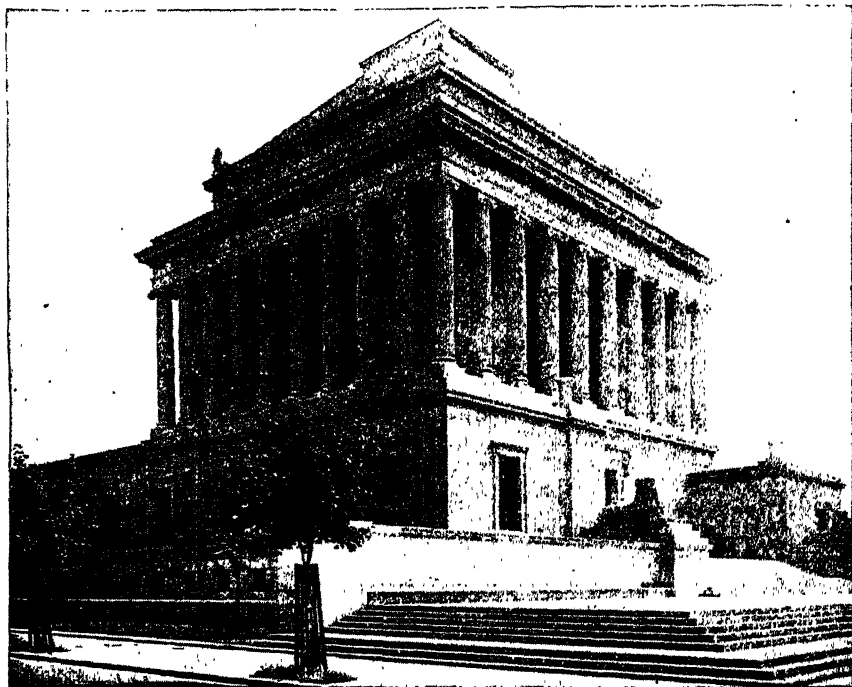
Freemasonry. The Ancient and Honorable Society of Free and Accepted Masons, the oldest and most widely distributed secret society in the world. It is founded upon a belief in Divinity and, as a fraternity, inculcates a system of pure morality by forms, ceremonies and symbolism in which the relief of suffering, the cultivation of the virtues, and the search for truth are emphasized. As now organized the society dates from 1717, when the four remaining lodges in London met and formed a grand lodge. There are various theories of the origin of Freemasonry, but Masonic students and historians agree that, while the rites and symbols of the fraternity are of great antiquity, the society, as now constituted, is only about two hundred years old. The forerunner of the modern grand lodge was the general assembly of Masons held at York, in 926, under the patronage of Edwin, where a code of laws was adopted which became the basis of the operative craft constitutions. Later, in the 17th century, attracted, no doubt, by reasons which readily suggest themselves, many Englishmen, Scotchmen, and others, attached themselves as 'accepted' members of the operative Free Masons and, in several directions in England, and Scotland, a marked change began to develop in some of the characteristics of the craft. Nowhere else than in the United Kingdom was Freemasonry, of either the operative or speculative type, then known in Europe. The seeds planted by the British workers' guilds, influenced by like organizations from north and south continental Europe, bloomed and bore fruit. With the revival in 1717, when four London lodges met and formed a grand lodge, there was only one degree and very little of the ceremonial, which took shape eight years later, when the three symbolic degrees of apprentice, craftsman and master, with the char-

acteristic legend and a wealth of symbolism, were found in the field.

With the revival of Freemasonry in 1717 came the inroads of membership from among the British gentry and nobility, and from the British army and navy officers. This, with the wide extension of British commerce gave the society a vogue, through the activity of the army and navy, in all parts of the world and was the prime cause of carrying the fraternity broadcast into Europe and America and the British colonies within little more

in 1801. The Henry Price Provincial Grand Lodge, at Boston, 1733, and the Philadelphia Lodge, which initiated Benjamin Franklin in 1731, and subsequently became a grand lodge, were the 'mother grand lodges of America.'

In the United States the two principal Masonic rites are, first, the American; and, second, the Scottish rite. The symbolic lodge with its three symbolic degrees, under exclusive Grand Lodge jurisdiction, is the fountain of each. Lodge members may take the degrees in one or both, as they elect, or rather as they are



Scottish Rite Temple, Washington, D. C.

than a decade. After England, France was the most active in spreading the fraternity, followed by the Grand Lodges of Pennsylvania, Massachusetts, Virginia, Ireland, Spain, the Netherlands and Germany.

The first Masonic lodge was established in New York in 1737, in Rhode Island in 1749, in Maryland and Connecticut in 1750, in Virginia in 1753, in North Carolina in 1754, in New Jersey in 1761, in Canada and in Maine in 1762, in Delaware in 1765, in Florida in 1768, in Vermont in 1781, in the District of Columbia and Ohio in 1783, in Kentucky in 1788, in Louisiana in 1793, in Michigan in 1794, in Tennessee in 1796 and in Mississippi

in 1801. The Henry Price Provincial Grand Lodge, at Boston, 1733, and the Philadelphia Lodge, which initiated Benjamin Franklin in 1731, and subsequently became a grand lodge, were the 'mother grand lodges of America.'

In the American Masonic rite, the Lodge, Chapter and Council require a belief in the Deity from would-be members, while Commanderies of Knights Templar require a profession of belief in Christ as the son of God. The Ancient Accepted Scottish rite has degrees drawn from the old or Jewish dispensation, but, as practised in the United States, election to bodies conferring the so-called Christian

degrees does not call, in all cases, for a profession of the Christian belief.

The Order of the Eastern Star, sometimes, though erroneously, referred to as Masonic, is a secret sisterhood to which only Freemasons and certain women relatives are eligible as members. It has been in existence a little more than fifty years.

Free Port, a seaport town, in which either no duty is charged on imported goods, and where any operation of industry or commerce may be carried on without state or territorial imposts; or where, within a certain defined area, such operations may be carried on free of any duty, either fiscal or excise. The Chinese ports termed 'free' come under neither of these categories, but are simply open to foreign trade, no absence of duties being implied. The number of such ports has been greatly diminished by the unification of customs, the raising of tariff walls in European countries, and the introduction of bonded warehousing.

Freeport, city, Illinois, county seat of Stephenson co. Pumps, gas engines, organs, hardware and leather are manufactured. It was the scene of the famous debate between Lincoln and Douglas in 1858; p. 22,366.

Freer, Charles Lang (1856-1919), American art connoisseur, was born in Kingston, N. Y. In 1905 he offered to the United States Government, on terms that were later accepted, his art collections, including paintings, Chinese, Japanese, Korean, Babylonian, and Central Asian potteries, and the decorations of Whistler's famous 'peacock room,' together with a bequest of \$1,000,000 to provide a suitable building for them in the Nation's capital. This building was opened in Washington, D. C., May 9, 1923.

Freer, Frederick Warren (1849-1908), American artist, was born in Chicago. Among his best-known works are *Behind the Fan*, *A Lady in Black*, *The Mirror*, and *The Young Mother*.

Free Reed, a kind of mechanism in use in certain musical instruments. There are various forms, but in all the tone is produced by the periodic vibration of a strip or tongue—usually of metal—fastened at one end over an orifice only slightly larger than the tongue, and having the latter so adjusted that a current of air will cause it to vibrate without coming in contact with the edges of the orifice. See HARMONIUM; ORGAN; REED.

Freesia, a genus of bulbous plants belonging to the order Iridaceæ, native to the Cape of Good Hope. They are produced chiefly in

Bermuda, California, and the Channel Islands.

Free Soil Party, a short-lived American political party which took part in two presidential campaigns—those of 1848 and 1852. The party was formed by a fusion of 'political Abolitionists,' and of that faction of the Democratic party in New York, known as 'Barnburners.' In 1848 Van Buren and Charles Francis Adams were nominated for the presidency and the vice-presidency respectively on a platform which closed with the frequently quoted words: 'Resolved, That we inscribe on our banner, "Free Soil, Free Speech, Free Labor, and Free Men," and under it will fight on, and fight ever, until a triumphant victory shall reward our exertions.' In the ensuing election the party's candidates received 291,263 popular votes, but no electoral votes. Subsequently the Free Soilers, generally, united with other political groups to form the Republican party. Consult T. C. Smith's *The Liberty and Free-Soil Parties in the Northwest*.

Free Spirit, Brethren of the, a fanatical sect which sprang up along the Rhine early in the 13th century and spread into France, Switzerland, Italy, and the Netherlands. They promulgated pantheistic doctrine and were accused of immoral conduct.

Freestone, a term applied to those rocks which are finely granular, uniform in texture, without well-marked lines of bedding, and which split readily in any direction, whether along the beds or across them.

Freetown, capital and chief town of the British colony of Sierra Leone, West Africa. The most notable edifices are the Cathedral, the fruit market, Princess Christian Cottage Hospital, and Fourah Bay College which is affiliated with Durham University. Freetown has an excellent harbor and an export trade in rubber, nuts, palm oil, and fruits; p. 44,142.

Free Trade. Freedom of trade, as the term has been used since the time of Adam Smith, means the removal of all restrictions on commerce that favor one form at the expense of another. It involves, in particular, the equal treatment of home and foreign productions. Encouragements to or restrictions on the export of commodities are a violation of the free-trade principle, since they tend to disturb natural economic conditions.

The policy of free trade rests on a few broad general propositions which are amply supported by experience. (1) The private individual is the best judge of his own interest in matters of trade. (2) In the pursuit of his private interest, each individual directs his commercial dealings in a manner, on the whole,

more conducive to the general interest than if he were guided by state control. (3) As consumption is the end and aim of all production, what is beneficial to the consumers must be for the interest of the community. Freedom affords the widest possible scope for international specialization of industry. Each country, by abandoning or diminishing those branches of production in which it finds itself at a disadvantage, is able to use all its industrial powers in the most suitable directions. Free trade, in fact, allows of the highest return being obtained from the natural agents, labor and capital, employed in production.

By a great many persons free trade is regarded as a theory incapable of being reduced to practice, and various exceptional cases have been suggested in which a departure from the rule of freedom may be desirable. The fact that the policy of most civilized nations is hostile to free trade raises, it is maintained, a presumption against it which is entitled to consideration. Indeed, even among free traders there is a disposition to regard the matter as one involving very complicated issues.

The most important exception on economic grounds is the case of new industries. These, it is held, require the protection of the state in their earlier years in order to overcome the initial difficulties that hamper all fresh enterprises.

Of somewhat similar character are the departures from free trade proposed in order (1) to increase or retain population and capital, or (2) to preserve the exhaustible natural resources of a country. Each is only capable of application under very stringent limitations, rarely, if ever, realized in practice.

Another group of exceptions is based on political or social considerations, such as the advantages of diversified industry, the necessity of maintaining high wages, or the supreme interest of national defence.

See Dudley North's *Discourses on Trade* (1691), perhaps the earliest exposition of free trade views; Adam Smith's *Wealth of Nations* (1776); W. J. Ashley's *The Tariff Problem* (2d ed. 1904); F. W. Taussig's *Selected Readings in International Trade and Tariff Problems* (1921), and *International Trade* (1927). See RECIPROCITY.

Freezing is the process by which a liquid takes the solid form. This is usually effected by cooling the liquid, or taking heat from it. The temperature at which in any given case this change takes place is called the freezing-point. At this same temperature, under the same physical conditions, the solid will liquefy;

hence the freezing-point is the same as the melting-point, or point of fusion. It is usual to speak of substances which are ordinarily liquid as having freezing-points, and substances which are ordinarily solid as having melting-points. The freezing-point of water is chosen as one of the convenient temperatures for forming a temperature scale. This temperature is called zero on the Centigrade or Celsius scale, and is marked 32 on the Fahrenheit scale.

Freezing-points are affected by change of pressure, being lowered when the substance expands on freezing, and raised when the substance contracts on freezing. The lowering of the freezing-point of water is only 0.0075 of a degree Centigrade for an extra atmosphere of pressure. It is sufficient, however, to give to ice some of its most important physical properties.

When a salt is dissolved in water the freezing-point is lowered. Thus, sea-water freezes at a lower temperature than fresh water. But what freezes is simply the water, the substance held in solution being, so to speak, frozen out. This separation of the solute from the solvent means work done—hence the necessity for abstracting more heat from the solution. The facts connected with the depression of the freezing-points of solutions have led to an interesting theory, in which the ionization or dissociation of molecules plays an important part. The pathologist has found the phenomenon of the depression of the freezing-point of blood useful in diagnosis. See SOLUTIONS.

Freiberg, town, Saxony; is the center of the Saxon mining industry. The cathedral, 1484, contains the burial vaults of the electors of Saxony from 1541 to 1694; p. 34,742.

Freiburg-im-Breisgau, town of Germany, grand-duchy of Baden; is the seat of a university founded in 1460. The cathedral is one of the most remarkable in Germany. The town is backed by the castle hill, formerly surmounted by two castles, which were destroyed by the French in 1744; p. 90,475.

Freights, Ocean. Ocean freighting may be classified under charter and line traffic. The staple articles, as wheat, lumber, coal, ores, etc., are as a rule assembled in vast quantities at the ports of shipment; their production is for the most part very irregular, fluctuating from season to season and from year to year. To accommodate this class of business a great number of slow-sailing vessels have been built, which are held by their owners subject to charter by any shipper who may need their service. Intense competition for freights

is the rule in the charter business, and rates fluctuate to an extraordinary degree. Numerous attempts at combinations to maintain rates have been made, but none of these have been in any degree successful.

Manufactures and perishable products are generally carried by line vessels. The freight rates are as a rule much higher, and the practice of agreements as to the fixing of rates is more common. These agreements do not, however, present the stability of agreements among land carriers. As a rule only a limited number of commodities are covered by agreements; competition between lines for the greater number of articles is intense, with consequent fluctuation in rates. As much of this kind of freight is light relatively to bulk, it is common for line vessels to complete their cargoes with bulky staple articles, thus entering into competition with charter vessels. Such articles are often carried for almost nothing, being necessary for ballast.

Freischütz, in German legend, a marksman in possession of magic bullets, six out of seven of which are, by the devil's agency, destined to hit any mark chosen by their owner; the seventh is, however, at the disposal of the devil, and must hit the mark chosen by him. The legend was most widespread from the 14th to the 16th century.

Freising, ancient town, Bavaria. Its cathedral dates from the 12th century. It possesses also an agricultural school, and a famous brewery; p. 17,000.

Frelinghuysen, Frederick (1753-1804), American soldier and politician, was born in Somerset co., N. J. He was very early active as a soldier of the Revolution. As colonel of a New York regiment, in 1777, he served under Washington, and the following year took part in the battle of Monmouth Court House. The same year, against his protest that he was too young, he was elected to the Continental Congress, where he remained until he was elected to the U. S. Senate in 1793.

Frelinghuysen, Frederick Theodore (1817-85), American politician, was born in Millstone, N. J. As city attorney of Newark, 1849, legal representative of the New Jersey Central R. R., and of other corporations, and attorney-general of the state from 1861 to 1866, he rose to eminence in his profession. In 1860 he served with distinction in the Peace Congress at Washington. President Arthur, in Dec., 1881, appointed Frelinghuysen secretary of state, a position which he held for the remainder of the presidential term.

Frelinghuysen, Theodore (1787-1862),

American legislator, son of Frederick Frelinghuysen, was born in Somerset co., N. J. In 1817 he became attorney-general of New Jersey, and had served twelve years when he was elected to the U. S. Senate as a Whig. After his retirement at the end of his term, he was in 1836 and 1838 elected mayor of Newark. In 1839 he was chosen chancellor of the University of New York, and held that position until 1850. In 1850 he became president of Rutgers College, N. J., and held that position at his death.

Frémiet, Emmanuel (1824-1910), French sculptor, born at Paris; was first known as a sculptor of animals. He then produced a series of statues and groups, mainly equestrian, among them *Joan of Arc* (1874); *Condé* (1881); and *Lesseps* (1900), at entrance to Suez Canal.

Frémont, John Charles (1813-1890), American explorer, was born at Savannah, Ga. He displayed extraordinary ability as a student. He served as civil engineer under Captain Williams of the United States topographical engineers, who were engaged in the survey of a route from Charleston to Cincinnati. During the remainder of 1838 and the greater part of 1839 he was engaged, under the explorer Nicollet, in a survey of the territory between the Mississippi and Missouri, up to the British line. In the summer of 1842 he entered upon the first of his five great exploring expeditions. He was instructed to explore the country lying between the Missouri and the Rocky Mountains, along the line of the Platte. This task he performed successfully, penetrating through the great South Pass, of which he prepared the first adequate description. His report on the Great Salt Lake region is said to have determined the Mormons in their choice of this region for settlement; and his report on California was an important factor in exciting American interest in that country, which, it was then believed, Great Britain was planning to annex.

In October, 1848, he set out on his fourth expedition, planning to find a direct route to California from the headwaters of the Rio Grande. He was unable to do this, and after great privations turned southward and entered California by the Gila route. In 1855 Frémont removed to New York city, in order to prepare for publication an account of his explorations. Upon the outbreak of war in 1861 he accepted a commission as major-general of volunteers, taking command of the Union forces in Missouri. After one-hundred days' service he was relieved of his command. In 1862 he was placed in command of the so-called mountain

district, in Kentucky, Tennessee, and Virginia. Dissatisfaction arose with his conduct of military operations, and his corps was incorporated in the Army of Virginia under General Pope, whereupon Frémont resigned. In 1878-81 Frémont was governor of Arizona; in April, 1890, he was appointed major-general and placed on the retired list. He died on July 13, 1890. Frémont's career has been the subject of much controversy, and not a little of the biographical material concerning him is obviously biased. The best sources to be consulted, however, are his own *Memoirs of My Life* (1887); Mrs. Frémont's *Souvenirs of My Time* (1887); the *Lives* by Bigelow (1856). See also CALIFORNIA.

Fremont Peak, highest mountain of Wyoming, in the Wind River group. It was ascended and measured by Frémont. Altitude 13,790.

French, Alice ('Octave Thanet') (1850-1934), American author, was born at Andover, Mass. She published *Expiation* (1890); *The Man of the Hour* (1905); *And the Captain Answered* (1917).

French, Daniel Chester (1850-1931), American sculptor, was born in Exeter, N. H. He had already executed the *Minute Man* (1875) at Concord, Mass., when he visited Florence for a year's study. There he worked in the studio of Thomas Ball. Returning to America in 1876, French lived in Washington, Concord, Boston, and New York. He became a member of the National Academy in 1902 and a chevalier of the Legion of Honor in 1910, and won various honors including a gold medal from the National Institute of Arts and Letters in 1918. Among his best known productions are busts of Emerson and John Boyle O'Reilly; statues of John Harvard, Rufus Choate, General Washington, Abraham Lincoln, General Grant; the groups *Europe, Asia, Africa, and America* in front of the New York Custom House, the colossal statue of the *Republic, Alma Mater* for Columbia University, and the statue of Lincoln for the Lincoln Memorial in Washington.

French, John Denton Pinkstone, First Earl of Ypres (1852-1925), British general, was born in Ripple, Kent. He served with the Nineteenth Hussars in the Sudan campaign of 1884-85, commanding the regiment 1889-93. He had command of the cavalry that accomplished the relief of Kimberley in 1900, and bore the brunt of the Boer attack in the battle of Diamond Hill. When Lord Kitchener took over the supreme command, General French was appointed to the command of the Southern

Transvaal, and in 1913 was made field-marshal. He was commander of the British Expeditionary Forces in France in the Great War, but after the battle of Loos retired in favor of General Haig, and was commander-in-chief of the forces in the United Kingdom in 1915-8. In 1919-21 he was Lord-Lieutenant of Ireland.

French, Mansfield (1810-76), American educator and philanthropist, was born in Manchester, Vt. He early removed to Ohio, and was concerned in the founding of Marietta College. Joining the Methodist Episcopal Church in 1845, he acted as agent for Wilberforce University, the first institution in America to admit negroes for instruction. He edited a religious monthly periodical, *The Beauty of Holiness*, which he transferred to New York City in 1858. In 1862 he organized the National Freedman's Relief Association. He headed a party of teachers which began work with negroes at Port Royal, S. C., and which, in spite of opposition, achieved considerable results.

French and Indian War (1754-63). In 1749 Céloron took formal possession of the Ohio Valley in behalf of Louis xv., and in 1753 Governor Dinwiddie of Virginia sent Major George Washington to warn the French away from this region; he, however, after a collision with the French at Great Meadows was forced to surrender at 'Fort Necessity' and to return to Virginia. This was virtually the beginning of the war. England did not formally declare war, however, until May 18, 1756. The French, however, were highly centralized, were more thoroughly organized for war, and had the assistance of superior numbers of Indians.

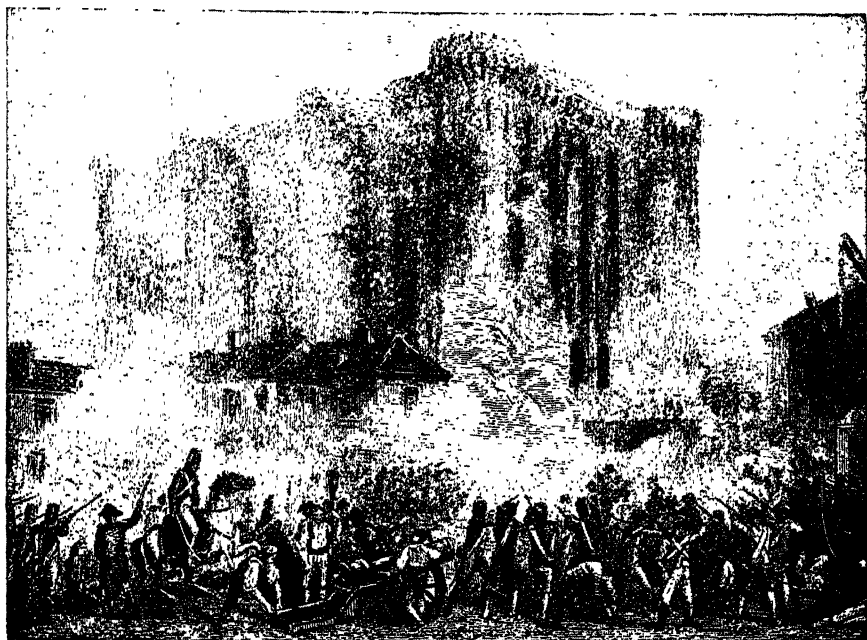
In 1754 delegates from the New England colonies and from New York, Pennsylvania, and Maryland, met in Albany, N. Y., to draw up a plan of colonial union and to make a treaty with the Iroquois, and the coöperation of the Six Nations was secured. In 1755 the British planned a simultaneous attack on Fort Duquesne, Nova Scotia, Crown Point, and Fort Niagara. The attack on Fort Duquesne under Gen. Edward Braddock, failed disastrously, the British force being totally defeated. The expedition against Nova Scotia succeeded, and, as a military measure, the Acadians were deported (1755); but the expeditions against Crown Point and Fort Niagara failed.

During 1756 and 1757 the French under Montcalm secured Oswego and Fort William Henry, the surrender of the latter being followed by the massacre of many of the English

by the Indian allies of the French. In 1757, however, William Pitt infused new vigor into the conduct of the war on the part of Great Britain. At the outset he planned the capture of Louisbourg (preliminary to the capture of Quebec), of Ticonderoga, and of Fort Duquesne; and he appointed General Abercrombie to replace Loudoun. In 1758 the British were on the whole successful; but General Abercrombie met a disastrous defeat on his attempt against Ticonderoga. In 1759 the British were even more successful. General Wolfe defeated Montcalm on the Plains of

of Africa, lying along the Atlantic Ocean between Nigeria and the Belgian Congo and Kabinda. It is divided into four administrative districts—Gabon, Middle Congo, Ubangi Shari, and Chad, to which Kamerun was added following its occupation in the Great War. The low-lying coast is diversified by the estuary of Gabun and the Ogowe mouths. Beyond the coast belt are the Crystal Mountains, reaching heights of from 3,000 to 4,500 ft. Farther inland is a plateau rising to nearly 3,000 ft., cleft by deep river valleys.

The natural resources of the colony include



The Capture of the Bastille, July 14, 1789.

(From an old print.)

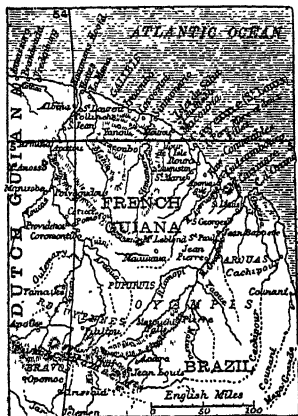
Abraham (Sept. 13), both Wolfe and Montcalm losing their lives, and Quebec, on Sept. 18, was surrendered to the British. With the surrender of Montreal to General Amherst on Sept. 8, 1760, the war in America came to an end, and by the treaty of Paris (1763), closing the Seven Years' War, Canada became a part of the British Empire. Consult Parkman's *Montcalm and Wolfe*; Winsor's *The Mississippi Basin*; Bradley's *The Fight with France for North America*; Casgrain's *Montcalm at Lévis*.

French Equatorial Africa, formerly known as the FRENCH CONGO, a colony on west coast

huge forests of valuable wood, and deposits of copper, zinc, and iron. The principal products are rubber, ivory, palm oil, coffee, vanilla, tobacco, copal, and cocoa. The chief towns are Libreville, the capital, Loango, Franceville and Brassaville; p. about 3,000,000.

The Gabon district was discovered by the Portuguese in 1470. The first French settlement was made in 1843. In 1910 the name was changed from French Congo to French Equatorial Africa. During 1942, with U. S. and British aid, the country was rapidly developed as a Fighting French military base.

French Guiana, or Cayenne, French colony on the northeast coast of South America. Its surface and geology are similar to those of the other Guianas, except that there is high ground near the sea. Other rivers are the Aprouague, Cayenne, Sinnamarie, and Mana, all obstructed by falls. About 6,500 convicts are confined at Cayenne, the *Iles du Salut*, and on the Maroni R. Captain Alfred Dreyfus was confined on the *Ile du Diable*. The sugar plantations have been abandoned, and only a little coffee and cocoa are produced; gold is the principal article; p. 32,908. The capital and port is Cayenne.



French Guiana.

French Guinea, colony of France on the west coast of Africa, lies between Sierra Leone and Portuguese Guinea. The coast lands are low and flat. About eighty miles inland begins the highland region of the Futa Jallon, rich in cattle and gold. The principal products are india-rubber, rice, millet, palm kernels, ground nuts, and wax. It was separated from Senegal in 1803, and its present boundaries were fixed in 1899.

French Revolution, The. The intellectual movement of the 18th century, connected with the names of Montesquieu, Diderot, Voltaire and Rousseau, prepared men's minds for the problems which the Revolution was to force upon the attention of the world. But the principal causes of the French Revolution were rather political and economical than intellectual. The continual misgovernment of France since the death of Louis XIV. led the Third Estate to seize the opportunity afforded by the bankruptcy of the government to insist upon drastic changes in the administration.

On May 5, 1789, the first States-general since 1614 met at Versailles. Sweeping aside the obstacles placed in its way by the nobles, the higher clergy, and the court, the Third Estate declared itself the National Assembly. An attempt of the court to effect a *coup d'état*, which included the dismissal of Necker, and the suppression of the revolution by force of arms, was answered by the Paris mob by the capture of the Bastille (July 14). The king then yielded on all points, and till 1792 the Revolution was carried through by the middle classes, who placed the government of France in the hands of Bailly and Lafayette.

The first duty of those in power was to check the riots which were taking place all over France, and to draw up a constitution. On Aug. 4, 1789, all feudal rights, together with privileges of every description, were abandoned. Then a Declaration of the Rights of Man was drawn up, the king was given a suspensive veto, and it was settled that the Assembly should consist of only one chamber. Fearing lest the king should escape, and dissolve the Assembly, and believing that the king's presence in Paris would lower the price of bread, a mob of men and women marched to Versailles on October 5, and on the following day brought the king and royal family to Paris. The king and National Assembly were now in the power of the Parisians, the royal family being practically imprisoned in the Tuileries, and the Assembly sitting hard by in the *manège*, or riding-school. From October, 1789, to September, 1791, the French National Assembly busied itself with framing a constitution, and in carrying out reforms. On Nov. 2, 1789, the property of the church of France was confiscated; on Feb. 13, 1790, all monasteries and religious houses were suppressed; and on Dec. 26, 1790, the civil constitution of the clergy became law. All beneficed clergy were to be elected, and every beneficed priest was to take an oath to observe the new civil constitution. A schism was the immediate result. Mirabeau attempted to guide the Assembly in the direction of a limited monarchy such as existed in England. But shortly after Mirabeau's death the king attempted to fly from France. Captured at Varennes, he was once more imprisoned in Paris, and the people were prejudiced against him.

Meanwhile the Assembly had completed the constitution, which became law in September 1791. Local governments were established, and all officials were elected. Before dissolving, the Assembly passed a self-denying ordinance prohibiting any member of the Constitu-

ent Assembly from becoming a member of the new Legislative Assembly, which met in October, 1791. Thus the solution of new and difficult problems was left to inexperienced men, who had to a great extent been elected under the influence of the Jacobin Club. In this Assembly the leading section was composed of Girondists, so called because they came from the Gironde, and of whom the leading representatives were Vergniaud, Gensonné and Guadet; connected with them were Roland and Madame Roland, Brissot, Isnard, and others. These men were republicans and desired a war with Austria, in the hope that the French king's overthrow would ensue, and that a republic would be formed.

Large bodies of French nobles were at Worms and Koblenz, watching for an opportunity of returning and of overthrowing the Revolution. The Girondists demanded that the emperor Leopold should expel the *émigrés* from German territory, and on April 20 Louis xvi. declared war upon Austria. Defeats on the frontier led to insurrections. The king was deposed, a republic set up, and a national convention summoned. The French now advanced against others than Austria. Belgium was conquered, and the Scheldt declared open to the commerce of the world. Europe now became thoroughly alarmed.

On Jan. 21, 1793, the Jacobins, with the connivance of the Girondists, brought about the execution of Louis xvi., and on February 1 declared war upon England and Holland. Spain, Portugal, the Empire, Tuscany, and the Two Sicilies at once declared war upon France. The defeat of the French at Neerwinden, and the flight of Dumouriez, the Girondist general, led to the overthrow of the Girondists. The situation was critical. A royalist rising had broken out in La Vendée. The Jacobins published the republican Constitution of 1793: to defend France they formed the Grand Committee of Public Safety (July 10). The rule of this committee is known as the Reign of Terror, and lasted for a year. An institution known as the Committee of General Security dealt with all police matters, while the revolutionary tribunal, founded in March, 1793, took cognizance of all political offences, and, as a rule, inflicted the penalty of death. Jacobin deputies were regularly sent on mission, and thus the provinces were brought into subordination to Paris. In the Grand Committee of Public Safety were to be found Carnot, Robespierre, St. Just, Couthon, Jean Bon St. André, Lindet, Prieur of the Côte d'Or, and Prieur of the Marne, and in Sep-

tember Billaud-Varenne and Collot d'Herbois were added. The revolt in La Vendée was put down, and the allied troops were driven from the frontiers.

Success was, however, at once followed by quarrels among the Jacobins. Robespierre looked with suspicion upon Hébert, who was popular with the mob in Paris, and he distrusted Danton, who was in favor of a relaxation of the system of terror. On March 14, 1794, the Hébertists were executed, and on April 5 the Dantonists suffered the same fate. Robespierre was now supreme. The Reign of Terror becoming more and more oppressive, a conspiracy was hatched in the Convention itself, and on July 26, 1794 (9th Thermidor) Robespierre was overthrown. This Thermidorian reaction lasted a little over a year during which the party in favor of moderation gradually gained ground. As Louis xvi.'s brother, the Count of Provence, refused to recognize that the *ancien régime* was over, the government drew up a new constitution known as that of the year iii. The executive was placed in the hands of five directors, and the legislature consisted of two chambers—the Council of Ancients and the Council of Five Hundred. One-third of the two councils were to retire annually, and while the Council of Ancients was concerned with diplomatic questions, the Council of Five Hundred initiated fresh taxation. To the directors was allotted the control of the armies and the fleets, the direction of foreign policy, and the management of the internal administration. None the less, on October 5 the insurrection of the 13th Vendémiaire broke out, and was only quelled by the assistance of the cannon of the young Bonaparte. The Convention hastened to elect the first five directors, and France entered upon the period known as that of the Directory. Because of the growing importance of the war and the influence of Bonaparte, however, this was merely the inevitable prelude to the consulate and the empire.

See Sybel's *History of the French Revolution* (Eng. trans. 1867-9); Sorel's *Europe et la Révolution Française* (1885, etc.); Morse Stephens's *The French Revolution* (1886); Taine's *The Ancient Régime and the Revolution* (Eng. trans. 1876-85); Carlyle's *The French Revolution* (1837); and histories of the revolution by Mignet (1824), Michelet (1847-53), Louis Blanc (1847-63), and Quinet (1865); Tocqueville's *France before the Revolution* (Eng. trans. 1888).

French Spoliation Claims. By the treaty of Feb. 6, 1778, between France and the United

States, France agreed to assist the United States in their war against Great Britain, and the United States in turn, agreed to guarantee forever to France her possessions in the West Indies and to give to French vessels certain exclusive privileges in American ports. When war broke out between France and Great Britain in 1793, however, President Washington issued a proclamation of neutrality, and in 1794, by the Jay Treaty, the United States granted to Great Britain certain privileges which amounted in effect to a breach of a provision of one of the French treaties of 1778. France, therefore, felt aggrieved against the United States. In turn, however, France seized, in violation of international law, a number of American merchantmen. For these seizures the United States demanded indemnity, but finally, by the convention of 1800, the demand was dropped, and France, on her part, released the United States from the obligations imposed by the treaties of 1778. The owners of the seized vessels, or their representatives, then presented their claims to the United States Government, which for more than three-quarters of a century refused to recognize their validity. Finally in 1885 an Act was passed, and signed, referring to the United States Court of Claims such claims to indemnity upon the French Government as arose 'out of illegal captures, detentions, seizures, condemnations, and confiscations' before 1801. The court was to pass on the claims presented, and to 'report to Congress, for final action, the facts found by it, and its conclusions.' By June 30, 1905, claims had been filed on 2,399 vessels; the amount found for claimants and certified to Congress was \$5,375,409; and the amount appropriated by Congress was \$3,950,452. Claims against France for depredations subsequent to 1801 were brought directly by the United States Government against France, but the refusal of France for a time to adhere to this treaty brought the two countries almost to the verge of open rupture during President Jackson's administration, the payment finally being made in 1836.

French West Africa. A number of French colonies in West Africa, administered under the authority of a governor-general, and comprising Dahomey, Dakar, French Guinea, French Sudan, Ivory Coast, Mauritania, Niger, and Senegal. Nov. 23, 1942, an agreement with the new Darlan regime aligned the federation with the United Nations.

Freneau, Philip (1752-1832), American poet, was born in New York City, of Huguenot

descent. He was a frequent contributor of patriotic verse to the *Freeman's Journal* of Philadelphia during the Revolution, and was editor of the *National Gazette* of Philadelphia for two years. He then edited a paper at Mt. Pleasant, N. J., and engaged in other journalistic work. He also engaged in shipping and seafaring mercantile activities, subsequently residing in Mount Pleasant, N. J. Freneau was the first distinctive American poet. His books include *The Poems of Philip Freneau, Written chiefly during the Late War* (1786), *Poems Written and Published during the American Revolutionary War* (1809).

Frequency Modulation (FM), in radio, is the system of broadcasting which uses modulation of the frequency of the transmitting wave in accordance with speech or a signal. The system is practically static free.

Frere, Sir Henry Bartle Edward (1815-84), English statesman, was born at Clydach, Brecknockshire, and entered the Indian civil service (1834). He was successively resident at Sattara (1846), chief commissioner in Sindh (1850-9), member of the viceroy's council (1859-62), and governor of Bombay (1862-7). In 1877-81 he was governor of the Cape, and first high commissioner of South Africa. The aim of his policy was South African confederation, but the recalcitrancy of the Boers and troubles with the Zulus which led to war (1878-9) thwarted him in carrying it out. See *Life* by Martineau (1895).

Frère, Pierre Edouard (1819-86), French genre painter; born at Paris, entered the studio of Delaroche. His first exhibits appeared in the Salon of 1843, and he soon acquired a wide reputation for delicate and sympathetic rendering of scenes from humble life. One of his pictures is in the Metropolitan Museum, New York.

Frère-Orban, Hubert Joseph Walther (1812-96), Belgian statesman, born at Liège. Elected Liberal member for Liège in the Belgian Parliament, he became minister of public works, and minister of finance. M. Frère-Orban was the Gladstone of Belgium. He wrote several works of great value, the most important of which were *La Question Monétaire* (1874) and *La Question Monétaire en Belgique* (1889).

Fréron, Elie Cathérine (1719-76), French critic, founded the journal *Lettres de la Comtesse de . . .* (1746), and on its suppression (1749), *Lettres sur quelques Ecrits de ce Temps*, which, in 1754, became *L'Année Littéraire*. In these periodicals Fréron, attacked Voltaire,

provoking a reply in the satirical drama *L'Ecossoise*, which has perpetuated the name of Fréron more successfully than have his own writings.

Fresco. The art of painting, or the work of art produced by painting, with a water-color medium upon either freshly laid or damped plaster is known as 'fresco.' The latter method, usually spoken of as *secco*, is understood to be the more ancient, and has outlasted fresco in actual practice. But the great decorations of the 14th, 15th, and 16th centuries were executed in fresco—upon freshly laid plaster. The palette available is a restricted one; for the colors, having to stand the action of the lime in the plaster, are principally those obtained from natural earths. Before beginning to paint, the artist usually prepares a colored sketch and a full-sized cartoon of each subject. Fresh plaster sufficient for a day's work is laid upon the wall, and then with a blunt iron stylus the outlines of the cartoon, held against the plaster, are traced, leaving indented lines on the surface beneath. The artist then proceeds with the actual painting, working with great rapidity and precision; retouching will never equal the original work in softness, spontaneity, and style.

Typical of the achievements of the great masters of this medium are the frescoes in Padua and Florence by Giotto; the church of S. Maria Novella (Florence), by Ghirlandaio; the convent of Saint Mark (Florence), by Fra Angelico; the Riccardi chapel (Florence), by Gozzoli; the Siena library by Pinturicchio and his pupils; the stanze of the Vatican, by Raphael; the Sistine chapel by Michelangelo. After the introduction of an oil medium by the Van Eycks, early in the 15th century, fresco was gradually displaced.

There are, however, occasional modern artists who revive this work. Among recent revivals were the Pre-Raphaelite School in England and the German Nazarenes; modern examples of fresco are the mural decorations by José Orozco at Dartmouth College, and Diego Rivera's in the International Workers' School, New York City. See DIEGO RIVERA. Consult Merrifield's *The Art of Fresco Painting as Practised by the Old Italian and Spanish Masters*; Ward's *Fresco Painting, Its Art and Technique*.

Fresh Air Work, a philanthropic movement to give the children of the slums and tenements of great cities a short period of recreation in the country or at the seashore. It is said to have been inaugurated by Rev. W. A. Muhlenburg, rector of the Church of the Holy Com-

munion, New York City, as early as 1849, and is at present carried on in cities throughout the United States, as well as in Europe and some few South American countries.

Freshfield, Douglas William (1845-1934), English explorer and author, was the first to climb Kazbek in the Caucasus, and about 1899 made a remarkable journey round Kangchenjunga at a high level. He wandered far beyond beaten tracks in Syria, Armenia, Bosnia, Corsica, Algeria, and in the Apennines and Alps. He published a valuable map of the Caucasus, and a number of works based on his explorations, including *Travels in the Central Caucasus and Bashun* (1869), and *Below the Snowline* (1923).

Fresnel, Augustin Jean (1788-1827), French physicist. His discoveries established the undulatory theory of light, first advanced by Young. He invented the Fresnel lenses for lighthouses, and introduced revolving lights.



Sigmund Freud.

Fresno, city, California, county seat of Fresno co., in the valley of the San Joaquin River. There are several famous parks including King's River Cañon, and Roeding Park; Kearney Park is an irrigated experimental farm of the University of California. Grapes for raisin-making, figs, and peaches are grown, and there are fruit-packing, dairying, and live-stock interests. The surrounding district contains oil and copper; p. 60,644.

Fret, or **Frette**, in heraldry, a narrow saltire interlaced with a mascle at the center of the

shield. *Fretty* is formed by a number of strips in bend interlaced with an equal number in bend sinister, forming a sort of trellis over the whole shield.

Fret Work, or Scroll Sawing, is the cutting out of thin board or sheet metal into patterns.

Freud, Sigmund (1856-1939), Austrian psychoanalyst, was born in Freiburg. He was graduated in medicine at the University of Vienna and became assistant physician and lecturer on nervous diseases at the Vienna General Hospital, later going to Paris, where he studied under Charcot. In 1902 he became professor of neurology in the University of Vienna, and gave impetus to psychological study. He was particularly known on account of his analysis and treatment of hysteria and his theory of dreams. He originated the psychoanalytic method for the treatment of neuroses, which had a tremendous vogue and influence. He was director of the *International Journal of Psychoanalysis*. Freud visited America in 1909.

The Freudian method is based on the theory that most cases of hysteria are the indirect result of shocks, emotional and usually sexual in nature. Memories, fears, or desires are suppressed, pushed into the subconscious, until they are forgotten; but they find expression in hysterical conditions or in dreams. Psychoanalysis endeavors to employ the patient's free associations as an aid to bringing these ideas into his conscious mind; when he becomes conscious of them he is supposedly on the road to recovery from their hysterical manifestations. Cases of 'shell shock' in the war caused the theory of sex as the controlling factor to be recognized as inadequate. After 1914 the Freudian theories underwent considerable revision and development by his former colleagues, especially Jung and Adler.

Under the restrictions placed upon Jews by Germany, Freud's Austrian property was confiscated in 1938 and he later resided in England. His writings have been translated and published in English by the Institute of Psychoanalysis, London; see also the *International Journal of Psychoanalysis*; Freud's *A General Introduction to Psychoanalysis* (trans. by G. S. Hall, 1921); *Group Psychology and The Analysis of the Ego* (1922).

Freund, Wilhelm (1806-94), German philologist. His chief work, the *Wörterbuch der lateinischen Sprache* (1834-45), is a standard lexicon.

Freycinet, Charles Louis de Saulces de

(1828-1923), French statesman and engineer. He was four times premier, and four times minister for war. He published *La Philosophie des Sciences* (1896), *La Question d'Égypte* (1905); *Mémoires* (1914). He was elected to the French Academy in 1891.

Freycinetia, a genus of evergreen tropical climbing plants of the family Pandanaceae, native to the Indian Archipelago.

Freyja, the Norse goddess of the spring, love, and fertility, sister to the god Freyr.

Freyr, or Frey, the Norse god of rain, fertility, and peace, was, like his sister Freyja and his father Njord, a survival from the pre-Odinic mythology. His festival was at the winter solstice (Christmas). A well known saga relates his wooing of Gerda, daughter of the frost-giant Gymir.

Freytag, Gustav (1816-95), German novelist and dramatist, was born in Kreuzburg, Silesia. Freytag's fame rests principally upon his dramas and novels. The comedy *Die Journalisten* is generally recognized as the best German comedy of the 19th century. In 1859 the tragedy, *Die Fabier*, was published and in 1863 *Die Technik des Dramas* (Eng. trans., 1894), notable for its critical insight. Freytag's first novel of modern life, *Soll und Haben*, appeared in 1855. It was followed by a series of popular historical essays. The eight years (1872-1880) following the author's brief political career were given to the cycle of seven novels entitled *Die Ahnen* (*Our Ancestors*). For his life, see his own *Erinnerungen aus meinem Leben* (1887; Eng. trans. 1890), and Seiler's *G. Freytag*.

Friar, a corruption of the French *frère*, is the popular distinguishing title of the members of the mendicant orders. The first friars were the Franciscans or Grey Friars and Dominicans or Black Friars. To these were added the Carmelites or White Friars by Innocent iv. (1224), and the Augustinian hermits or Austin Friars by Alexander iv. (1256). In the 15th century the Servites and Trinitarians or Crutched Friars were granted the same privileges as the four mendicant orders.

Friar's Balsam, popular name for the compound tincture of benzoin, prepared by dissolving benzoin, storax, tolu balsam, and aloes in strong alcohol.

Fribourg, or Freiburg, a canton in the western part of Switzerland. The southern and eastern parts are elevated, and the north-western part lies in the basin of Lake Neuchâtel capital, Fribourg. The canton is especially famous for its cheese. Tanning and straw-plaiting are carried on, and watches,

leather goods, paper, and cigars are manufactured; p. 143,055.

Frick, Henry Clay (1849-1919), American manufacturer and capitalist, born in West Overton, Pa. He was president of the H. C. Frick Coke Company, and was connected with many large business enterprises. His New York home has been made an art museum.

Friction. When two bodies rub on each other, there is a force where the rubbing occurs called friction which resists motion. The laws of friction were first investigated by Coulomb in 1781 and Morin in 1831-3, and since then have been studied by many experimentalists.

COMPARISON OF THE LAWS OF SOLID AND FLUID FRICTION (Perry).

Solid.

1. The force of friction is not much affected by the velocity, but is greatest at low speeds.

2. The force of friction is proportional to the total pressure between the two surfaces.

3. The force of friction is independent of the areas of the surfaces in contact.

4. The force of friction depends to a great extent on the nature of the surfaces in contact.

Fluid.

1. The force of friction depends on the velocity, and is very small when speed is very low.

2. The force of friction is independent of the pressure.

3. The force of friction is proportional to the area of the wetted surface.

4. The force of friction is not greatly affected by the nature of the surfaces when the speeds are moderate.

To minimize the effect of friction lubricants are used. With very good lubrication, as with an oil bath, the lubricant is constantly carried to where it is required, and heavy loads may be sustained without seizing, the laws of fluid friction being approximately followed.

The number of foot-pounds of work wasted or degraded into heat is the product of the frictional force in pounds and the distance through which rubbing occurs in feet.

Tables of values of coefficients of friction are to be found in such books as Molesworth's *Pocket-Book of Engineering Formulae*; Trautwine's *Engineer's Pocket-Book*. For further information, consult Tait and Thomson's *Natural Philosophy*; Professor Perry's *Mechanics*; also 'The Cantor Lectures on Friction,' by Professor Hele-Shaw, *Journal (London) Soc. Arts*, 1886, vol. xxxiii.

Friction Rollers, cylindrical or conical rollers usually of hard steel, placed under a body so that it may roll instead of slide, rolling being easier than sliding in most cases. Ball bearings are of a similar nature.

Friday, the sixth day of the week. Among Germanic peoples it was sacred to the goddess-mother Frigga, wife of Odin. Friday, having been the day of the Crucifixion, is kept as a day of abstinence in the Roman Catholic Church. Friday being also the day of Adam's creation, is kept by Mohammedans as their weekly day of prayer.

Fried, Capt. George (1877-), sea captain. During his service as master of vessels for the United States Lines he figured in a series of dramatic rescues at sea. In 1926, as captain of the *S.S. Roosevelt* he rescued the crew of the steamer *Antinor*; in 1929 as captain of the *America* he saved the crew of the freighter *Florida*, and in 1934, while master of the *Washington*, he picked up five aviators whose plane had crashed 600 miles at sea. In 1934 he was appointed supervising steamboat inspector at New York.

Friedland. (1.) Old historic town of Bohemia, at the north foot of the Isergebirge. (2.) Town, East Prussia, 26 m. s.e. of Königsberg, scene of the defeat of the Russians and Prussians by Napoleon on June 14, 1807; p. (1900) 2,824.

Friends, Society of. The rise of the Society of Friends was the result of the preaching of George Fox (1624-90). He taught that there was a direct divine revelation or 'inner light' given to every man, and that religion, therefore, was primarily a matter of individual conviction and experience. From this fundamental principle arose most of the distinctive views and practices of Fox and his followers. They insisted on the need of spiritual insight for the right understanding and use of the Scriptures. They held that the sacraments of baptism and the Lord's Supper were not essential; that there was no need of a ritual or of an ordained ministry; that women as well as men should be free to exercise the gift of preaching; and that silence was the fittest basis of public worship. They held also that war was incompatible with the spirit of Christianity, and refused to take oaths. They laid stress on the need of upright conduct and simplicity of life, and the application of the principles of religion to practical affairs.

Fox and his followers at first called themselves 'Children of the Light.' They soon, however, adopted the name of 'Friends,' and were also commonly known as 'Quakers.' In

1680 there were at least 40,000 members of the society in England and Wales. Although Fox had originally no intention of founding a sect, he recognized the necessity of organizing the body which his preaching had brought into being. He therefore established a system of church government which, with certain additions, has continued to the present day. About the year 1666 the society was joined by Robert Barclay, and in 1668 by William Penn; and in their writings the distinctive views of the Friends found expression in a scholarly form.

The missionary zeal of the early Friends took them to many countries; and Fox himself travelled in the American colonies, the West Indies, and Germany and Holland. In 1681 William Penn obtained from Charles II. a grant of the colony of Pennsylvania, in which he proposed to show that Quaker principles could be applied to political affairs. In the following year he sailed with his unarmed colonists, and signed his famous treaty with the Indians. This treaty was faithfully kept, and it is stated that no Quaker was ever killed by an Indian in Pennsylvania. Other Friends settled in Boston, New Jersey, and Rhode Island.

Until the end of James II.'s reign the Friends were the victims of continual persecution. It is estimated that by 1697, 16,735 Friends had been imprisoned and 152 transported, and that 370 had died in confinement or in consequence of their sufferings. James II.'s Declaration of Indulgence at length brought them a respite, and the era of persecution closes with the passing of the Toleration Act in 1689 and of a statute enabling them to affirm instead of taking oaths in 1696.

Debarred from political life by their unwillingness to compromise their religious testimonies and by their principles from the military profession, the Friends mainly devoted themselves to commercial occupations and to philanthropic objects. John Woolman, an American Friend of singularly beautiful character, labored for the liberation of the slaves, and the Friends, roused by his efforts, warmly supported the movement.

The Society has no creed, but the theological views expressed in its official documents do not differ materially from those embodied in the Apostles' Creed. It contains, however, two distinct (though mutually tolerant) schools of thought, which may perhaps be best described as 'mystic' and 'evangelical.' The former aims at maintaining intact the principles of Quakerism with regard to the spiritual character of religion; the latter is especially concerned with mission work. The Friends' Board of Foreign

Missions supports many good works in the Orient, Mexico, Africa and other places.

There are twenty-eight Yearly Meetings of Friends in the United States. Twelve of them are grouped together under the name of The Five Years Meeting of Friends. Seven are known as the General Conference, and the remainder are more familiarly known as Conservative Orthodox.

1. The Five Years Meeting, representing the largest body of Friends in the United States, are essentially evangelical in their belief and are associated with other evangelical churches. Once in five years they send official delegates to a Conference to consider questions of mutual interest.

2. The General Conference is made up of those Yearly Meetings formerly known as Hicksites, so named because of a split that occurred in the Society under the leadership of Elias Hicks (1784-1830), a noted minister of New York Yearly Meeting of Friends. The separation, which took place in 1827 in Philadelphia, originated in an attempt by the Elders of Philadelphia to discipline Hicks, who was preaching in Pennsylvania, for alleged unsoundness of doctrine. This brought to light a fundamental difference in the Society of Friends. The orthodox section claimed that the basis of membership was doctrinal, and that the elders had the right to pronounce as to doctrinal soundness. The opposite party asserted that the church depended on immediate revelation of truth to the individual, and that neither elders nor any other body had the right to formulate a creed for others. A large majority of the Yearly Meeting sided with Elias Hicks.

3. The Conservative Orthodox. This group is not organized, but are more or less united in opposition to the modern methods of evangelistic work, and in maintaining testimonies in favor of meetings for worship on the basis of silence.

Consult Braithwaite's *The Beginnings of Quakerism* and *The Second Period of Quakerism*; Rufus M. Jones' *The Quakers in the American Colonies* and *The Later Periods of Quakerism*, Sharpless' *The Holy Experiment*, *The Journal of John Woolman*, *The Journal*, and the *Epistles of George Fox*; Richard H. Thomas' *The History of the Society of Friends in America*; Holder's *The Quakers in Great Britain and America*, and the various books of discipline.

Friends of the People, a British society called into being in 1792 by the French Revolution. Its object was to secure parliamentary

reforms not by agitation but by ordinary constitutional means. The society included Lords John Russell, Kinnaird, and Edward Fitzgerald, also Sir James Mackintosh, Dudley North, Erskine, and Sheridan.

Friends of the Temple, a sect which arose in Germany (c. 1840) under the leadership of Rev. Christopher Hoffmann, the principal aim of which is the gathering of the people of God in Palestine. They accept the law of Moses and the Gospel of Christ, believe in the coming fulfilment of all Scripture prophecy, and leave to individual choice the use of baptism and the Lord's Supper. Consult Hoffmann's *Occident und Orient*.

Frieseske, Frederick Carl (1874-), American artist, was born in Owosso, Mich. He received many prizes, among them the grand prize for painting at the Panama Ex-

position, 1915, and a gold medal in Munich. He is a member of the National Academy. He is represented in the galleries of Venice; Odessa; the Luxembourg, Paris; the Metropolitan Museum, New York City; Chicago, Detroit, and other American cities.

was laid upon all dwelling houses and lands, and on slaves between the ages of twelve and fifty. The value of the dwelling houses was to be determined on the basis of the size and number of windows in these houses, and an impression thus got abroad that citizens, who owned houses, were being taxed for having windows, the tax thus coming to be known in some communities as a 'window tax.' In the Eastern counties of Pennsylvania (Northampton, Bucks, Montgomery, Lehigh, and Berks), the large German element vigorously opposed the tax, and under the leadership of Fries, resisted by force (March, 1799) the Federal officers sent to measure windows preparatory to assessing the owners of dwelling houses.

Fries was arrested, was tried on a charge of treason—the first trial of the sort in the history of the United States—and was convicted



Frieze in Colored Plaster: 'Music and the Dance', by R. Anning Bell.

position, 1915, and a gold medal in Munich. He is a member of the National Academy. He is represented in the galleries of Venice; Odessa; the Luxembourg, Paris; the Metropolitan Museum, New York City; Chicago, Detroit, and other American cities.

Friesland, province, Netherlands, in the extreme northern part. The province is famous for its horses, cattle, and sheep. Fishing is an important industry. The capital is Leeuwarden; p. 399,345. See **FRISIANS**.

Fries Rebellion or Insurrection, an uprising in Eastern Pennsylvania in 1799, led by one John Fries (c. 1764-1825). By act of July 14, 1798, Congress imposed a direct tax of \$2,000,000, which was to be equitably apportioned among the various States and which

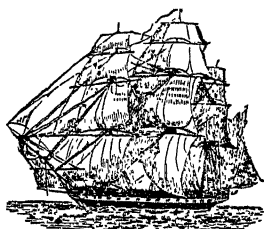
(1799). Fries was pardoned by President Adams, and subsequently became a prosperous dealer in tinware in Philadelphia. See Fisher, *Pennsylvania, Colony and Commonwealth* (1897), and Davis, *The Fries Rebellion* (1899).

Frietchie, Barbara (1766-1862), was born (Hauer) at Lancaster, Pa. She was the daughter of German immigrants, and was married to John Caspar Frietchie, of Frederick, Md., in 1806. The incident of her waving a Union flag at the Confederate troops as they marched by her house on Sept. 10, 1862, made use of by Whittier as the subject of a poem, is generally regarded as mistaken.

Frieze, strictly speaking, that part of the entablature of a building which forms a band between the architrave and the cornice, but

more freely used to designate the decoration applied to that portion. The decoration varies with the order of architecture. Familiarly, in domestic architecture, the word frieze is applied to the band of decoration just below the cornice of an interior.

Frigate. Originally, the name was applied in the Mediterranean to a kind of long vessel navigated with sails and oars. In 1649 it was



Frigate.

applied to a class of small fast-sailing ships built for the British navy. When the Seven Years' War broke out, the frigate class, as technically known, first came into existence, the first of the type being the *Southampton*, of thirty-two guns, built in 1757. These frigates were originally fast full-rigged vessels of from 600 to 700 tons burden, designed for scouting and cruising duties, and the essential feature in them was that they carried all their guns on a single deck. The size and armament were from time to time increased, and by 1800 some of them carried as many as fifty guns, though nominally rated as 44-gun ships. The frigates *Constitution*, *United States*, and *President*, of the United States navy, were vessels of this sort.



Frigate-bird.

Frigate-bird, or Man-of-war Bird, a member of the sub-order Steganopodes, and one of the swiftest and most active of marine birds. Truly pelagic in habit, it feeds entirely

upon fish, and rarely comes to land except at the breeding season. The great frigate-bird (*Fregatus aquila*) is found in the warmer parts of the great oceans; the lesser (*F. minor*) is confined to the Indo-Pacific Ocean. The greater frigate-bird is about four feet in length, with a wide expanse of wing, and is brownish-black in color, with metallic reflections, and a scarlet patch on the throat.

Frilled Lizard (*Chlamydosaurus Kenti*), a very curious reptile found in Queensland and other parts of Australia, and belonging to the lizard family Agamidæ. It reaches a length of about thirty-two inches, and receives its name from the presence of a large expansion of the skin at either side of the neck, the two halves meeting at the throat. This frill is notched at the edge, and can be folded or expanded at will. The lizard walks upon its hind limbs, having the fore limbs hanging down. When at bay, it expands the frill to its fullest extent.

Fringe Tree, a hardy North American shrub, *Chionanthus virginica*, so called on account of its finely segmented corolla. In May it bears abundant and graceful terminal racemes and fragrant white flowers.

Frisians, a Germanic people (Frisii) who for close upon two thousand years and more have dwelt on the shores of the North Sea, between the Scheldt and the Elbe, and thence northward as far as the coast of Jutland. After a struggle of nearly two hundred years with the Franks, they were subjugated by Charlemagne. They were, and still are, a capable seafaring race, and have always been animated by a strong instinct of freedom. With the Angles and the Saxons bands of Frisians settled in England in the 5th century. Their annals are full of dramatic incidents connected with their century-long struggles against the encroaching ocean. In this conflict the most memorable events have been the formation of the Zuider Zee by an irruption of the sea in 1282, the gradual formation of the Dollart during the 13th and 14th centuries, and the destruction of the former island of Nordstrand by a terrific gale in 1634. But the sea has always gone on unceasingly breaking down the islands. Norderney (immortalized by Heine), Sylt, and other islands in the Frisian group are much visited in season for purposes of sea-bathing. See the useful summaries of Dr. Eugen Traeger, *Die Halligen der Nordsee* (1892); C. P. Hanson, *Die Chronik der friesischen Uthlande* (1856); and C. Jensen, *Vom Dunenstrand der Nordsee* (1901).